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# RESULTS OF THE 1984/85 MONITORING OF THE SAINT JOHN RIVER, N.B.

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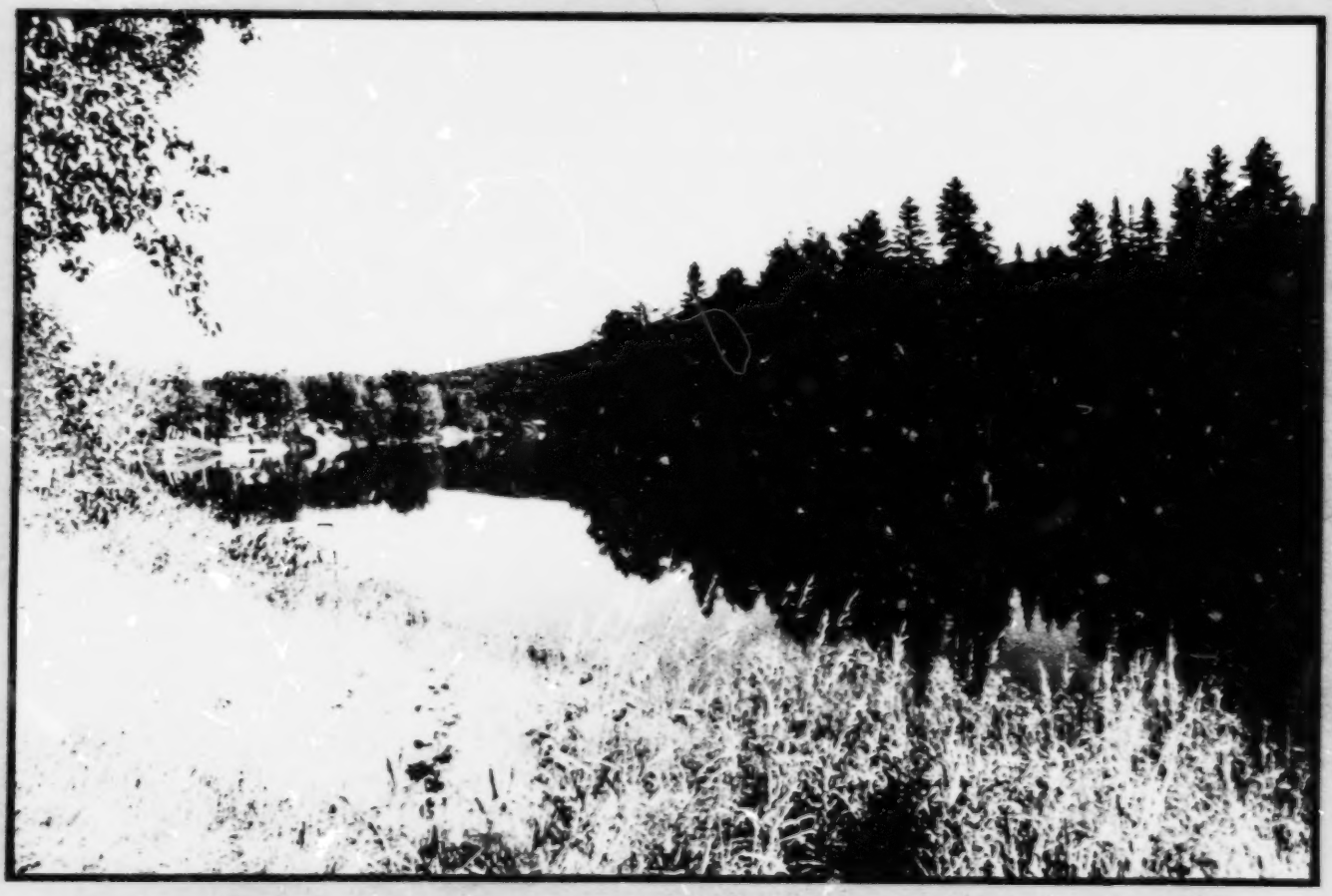

INLAND WATERS DIRECTORATE
ATLANTIC REGION
WATER QUALITY BRANCH
MONCTON, NEW BRUNSWICK

# RESULTS OF THE 1984/85 MONITORING

# OF THE SAINT JOHN RIVER, N. B.

IWD-AR-WQB-85-77

Inland Waters Directorate

Environment Canada

Geoffery Howell

Water Quality Branch

Atlantic Region

Moncton, New Brunswick

March 7, 1985

A copy will be made available in French upon request.

TABLE OF CONTENTS


PAGE

Letter of Transmittal ..... i

Abstract ..... ii

Resume ..... ii

Introduction ..... 1

Results and Discussion ..... 3

- Water Temperature ..... 3
- pH ..... 5
- Specific Conductance ..... 7
- Dissolved Oxygen ..... 10
- Water Colour ..... 11
- Total Alkalinity ..... 13
- Major Ions ..... 15
- Heavy Metals ..... 18
- Nutrients ..... 23

Conclusions and Recommendations ..... 27

References ..... 30

List of Tables ..... 31

List of Figures ..... 35

Appendix I ..... 62

Table 1 ..... 63

Table 2 ..... 71

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# LETTER OF TRANSMITTAL

Water Quality Branch
Inland Waters Directorate
Environment Canada
P. O. Box 861
Moncton, New Brunswick

Dr. P. E. Belliveau, Chairman
International Technical Advisory Sub-Committee
on Water Quality in the Saint John River

Dear Dr. Belliveau:

The Water Quality Branch is pleased to transmit to you a report on the 1983/84 Saint John River Monitoring. This report compares the data to water quality objectives and discusses the spatial and temporal variation of selected parameters.

Your questions or comments on this report would be appreciated.

Yours truly,

D. H. Cullen, Chief
Water Quality Branch

Canada

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## ABSTRACT

This report presents the results of six samplings of the International Saint John River during 1983 and 1984. The water quality data indicate that on most occasions the Saint John River water quality objectives were met. Of the tributaries sampled, only the Madawaska and Green rivers appeared to have any significant effect on the overall water quality of the Saint John River. The spatial variation of selected water quality parameters is discussed and is used to propose a monitoring program which is not only resource efficient but will also provide the information necessary to understand the factors controlling the water quality of the Saint John River.



## RESUME

Ce rapport présente des données obtenues suite à six échantillonnages de la portion internationale de la rivière Saint-Jean effectués en 1983 et 1984. Les données recueillies indiquent que les objectifs de la qualité des eaux visés pour la rivière Saint-Jean ont été rencontrés la plupart du temps. De tous les tributaires échantillonnés, il semble que seulement les rivières Madawaska et Green ont un effet significatif sur la qualité globale des eaux de la rivière Saint-Jean. La variation spatiale de certains paramètres de la qualité des eaux est discutée et est utilisée pour proposer un programme de relevés qui, non seulement est efficace au niveau des ressource impliquées, mais peut aussi fournir l'information nécessaire pour comprendre les facteurs contrôlant la qualité des eaux de la rivière Saint-Jean.

# INTRODUCTION

The portion of the Saint John River between the Saint Francis River and Grand Falls forms the international boundary between Canada and the United States. In order to provide data to the International Technical Advisory Subcommittee on Water Quality in the Saint John River and assist in water quality management, the Water Quality Branch of Environment Canada regularly monitors the Saint John River and its major tributaries.

This report presents the results of bimonthly sampling during the period December, 1983 to October, 1984. These results span two fiscal years and as a consequence of the adoption of a more extensive monitoring network during 1984/85 will be handled as two separate data sets. Commencing in April, 1984 an additional 9 stations were added to the 11 station water quality monitoring program in an attempt to assess the relative importance of the major tributaries on the water quality of the mainstem Saint John River. It is intended that this approach will not only provide information on point source loadings but will also provide a basis for development of an effective and resource-efficient monitoring network. Lists of station descriptions and parameters analysed are given in Tables 1 and 2 respectively while the data are presented in Appendix 1. Figure 1 outlines the study area and indicates the location of the monitoring stations.

During the period December, 1983 to March 31, 1984, water samples were collected from eleven stations, three of which were located on the mainstem Saint John River. The results for this portion of the monitoring program are presented in Appendix I and will be included in the discussion of water quality trends and compliance with water quality objectives.

## RESULTS AND DISCUSSION

### Water Temperature

Water temperature for the Saint John River monitoring stations ranged from a low of 0.0°C during the winter up to a maximum of 23.5°C in late August (Figure 2). During the winter months, water temperatures were similar at all stations, having a range of 0°C to 2°C. During the ice-free period, water temperature within each sampling exhibited a 6°C range. An exception to this occurred during the late June, early July sampling when water temperatures ranged from a low of 10.5°C at Little River up to a high of 22.5°C at the Caron Brook station. The three sites with the elevated temperatures during this period were sampled six days after the other stations and thus it appears that high ambient air temperatures during this six day interval resulted in increased water temperatures. Excluding these three stations, water temperature measured during late June ranged from 10.3°C to 15.8°C.

Figure 3 shows the WQB monitoring stations and provides some insight into the downstream variation of water temperature. The position of the mainstem stations and tributary confluences are presented to scale and the length of the tributary lines indicate the relative drainage basin areas. From Figure 3 it is apparent that the mainstem Saint John River exhibits little spatial variation of water temperature. The greatest observed variation is at the Saint Basile station which is

significantly affected by the large volume of Madawaska River water entering the Saint John River 6.0 km upstream. For example, during late June cooler Madawaska River water is able to lower the water temperature from 15.5°C at Edmundston to 13.5°C at Saint Basile. Although the tributaries below Saint Basile generally have lower water temperatures than the mainstem river, they appear to have little effect on the water temperatures at Saint Leonard and Grand Falls.

pH

The waters of the Saint John River system are well buffered and are characterized by pH values near circumneutral. As part of the Saint John River monitoring program, field as well as laboratory pH measurements were taken. However, past experience has indicated that field pH measurements are often unreliable, particularly during cold weather operation. From Figure 4, it is readily apparent that there is poor agreement between field and laboratory pH values and for this reason, the following discussion is based on laboratory values. From the raw data it appears that poor agreement was observed during the May and October sampling and can be attributed to faulty pH electrodes on the field meter.

During the 1984/85 monitoring, pH ranged from 6.2 to 8.7 with the lowest values observed during the winter. The highest pH values were observed in the four transboundary streams (Limestone, Aroostook, Presquile and Meduxnekeag) which enter the Saint John River below Grand Falls. High pH values are characteristic of these four sites which have calcareous deposits in the drainage basin. Excluding these four stations, pH ranged from 6.2 to 7.9. On all occasions the pH values were within the proposed upper and lower water quality objectives established for the Saint John River. (Figure 5)

The spatial variation of pH for the May to October samplings is presented in Figure 6. The pH of the river mainstem appears to be

extremely stable varying by less than 0.5 pH units from Saint Francis to Grand Falls. The tributaries generally exhibit higher pH than observed for the mainstem but as was the case with water temperature, they had little effect on downstream pH.

Specific Conductance

As was the case for pH, specific conductance was measured both in the field and in the laboratory. However, unlike pH, there is a good relationship between field and laboratory values (Figure 7).

Laboratory specific conductance was extremely variable during the study period ranging from 39 uS/cm to 378 uS/cm. The lowest values were observed during the spring at stations located above Edmundston while the maximum value was recorded at the Madawaska River during low flow conditions in October. The high specific conductance observed for the Madawaska River on all occasions indicates the influence of point source loading of pulp mill liquor from the Fraser Paper Company in Edmundston. Limestone Brook also exhibited high specific conductance on all sampling dates as a result of dissolution of calcareous deposits in the drainage basin.

From Figure 8, it is readily apparent that there are considerable spatial and temporal variations in specific conductance of the international portion of the Saint John River. Conductance at Grand Falls has been shown to be related to river discharge (Bingham & Howell, 1983) and it appears that this is also true for the stations sampled in 1984/85. During periods of high discharge in the spring and early summer (May and June) specific conductance is low. However, in the autumn when river discharge is characteristically at a minimum, specific conductance values are elevated.

The mainstem Saint John River from Saint Francis to Caron Brook is dilute and exhibits little change in specific conductance despite the introduction of more concentrated water from the Saint Francis and Little Rivers. This would suggest that unaccounted for interbasin drainage must be sufficiently dilute to overcome the effects of the more concentrated inputs. The fact that the specific conductance observed at Clair is similar to that at Caron Brook is significant in that the Fish River which drains a large area (2660 $km^2$) of the State of Maine enters the Saint John River just below the sampling station at Clair. This would indicate that the Fish River has a specific conductance similar to that observed for the mainstem Saint John River. From Caron Brook to Edmundston there is a slight increase in specific conductance on all occasions. Although Baker Brook is obviously more concentrated, its small drainage area would suggest that it has only a modest effect on the mainstem Saint John River. However, it may be that the more concentrated nature of Baker Brook typifies the interbasin drainage for this area which may explain the slightly elevated specific conductance observed at Edmundston.

As was previously mentioned, the Madawaska River has high specific conductance which coupled with the large volume of water has a significant effect on the mainstem Saint John River. Conductivities observed at Saint Basile were almost double those recorded upstream at Edmundston. During the August sampling the specific conductance observed at Saint Basile was not only double the value observed at Edmundston but

was also greater than the value recorded for the Madawaska River. This can probably be explained by the fact that the Saint Basile waste treatment facility which handles waste water from the town of Edmundston and the Fraser Paper Company discharges its treated effluent into the Saint John River upstream from the Saint Basile monitoring station. Below Saint Basile, the tributaries are more dilute than the mainstem and thus serve to lower the specific conductance of the Saint John River. As would be expected the Green River seems to have the most influence in this regard, as indicated by the similarity of Green River and Saint Leonard conductivity. From Saint Leonard to Grand Falls the specific conductance of the Saint John River appears to be stable, indicating the absence of significant point source loadings of dilute or concentrated water along this stretch of the river.

Dissolved Oxygen

Solubility of dissolved oxygen in freshwater is inversely related to water temperature and thus the lowest concentrations are generally observed during the summer months. Dissolved oxygen concentrations are also dependent on the rates of primary production, respiration and the chemical oxygen demand.

The dissolved oxygen concentrations ranged from a low of 8.6 mg/L in August to a maximum value of 14.9 mg/L in December. Figure 9 indicates that all dissolved oxygen concentrations were well above the 6 mg/L acute water quality objective which has been established for the Saint John River. In addition, dissolved oxygen saturations complied on all occasions with the 80% acute objective (Figure 10), ranging from 82 to 125% saturation. Overall, the highest percent saturations were observed during the May sampling while the lowest values occurred during the summer and fall.

Water Colour

The Saint John River and its major tributaries are moderately coloured, ranging from a low of 10 Hazen Units up to a maximum of 120 Hazen Units. Although the mainstem Saint John River water colour appears to be relatively stable, ranging from 30 to 75 Hazen Units, the tributaries exhibit considerable variation.

The spatial variation of water colour for the monitoring stations is presented in Figure 11. Water colour of the Saint John River at Saint Francis was moderate, having a range of 30 to 75 Hazen Units. Despite lower water colours at Saint Francis River and Little River, the mainstem river values observed at Clair were neither consistently lower nor higher than values recorded upstream. It is probable that variable point source loadings of organic matter resulting from anthropogenic activities in the drainage basin are responsible for these variable water colours. For example, the high water colour recorded at Baker Brook in August was the result of stream bed construction during a high run-off period. Similarly, high run-off during the August sampling may explain the high water colours observed at Clair and Caron Brook.

From Edmundston to Grand Falls there appeared to be little variation in water colour. The Madawaska River did exhibit fluctuations depending on whether or not the Fraser Paper Company was discharging pulp mill effluent, but even during periods of high colour there was little effect on the mainstem Saint John River. Below Saint Basile, the

Green and Quisibis Rivers were clear while the Siegas and Grand Rivers exhibited moderate colour levels. The elevated water colours observed for the Seigas and Grand Rivers during the June sampling corresponded to high suspended solids loads and high turbidity and thus appear to be the result of local drainage basin disturbances. Of these four tributaries the Green River had the dominant effect on the mainstem water colour, resulting in Saint Leonard water colours which are equal to or less than those observed at Saint Basile. From Saint Leonard to Grand Falls there was little change in the Saint John River water colour.

Water colour in lakes is often closely related to the concentration of dissolved organic carbon with colourless water usually having a carbon concentration of about 5.0 mg/L. Figure 12 indicates that for the Saint John River monitoring program rivers there is a good linear relationship between colour and carbon. However the intercept indicates that colourless river water has a dissolved organic carbon concentration of 1.2 mg/L. This value indicates the background level of carbon in this system and represents autochthonous production of organic matter. The additional carbon observed in the coloured waters is generally associated with soils and humic compounds which are produced allochthonously. The low autochthonous organic carbon concentration is indicative of the oligotrophic nature of the Saint John River and its tributaries.

Total Alkalinity

The Saint John River system appears to be well buffered with the lowest total alkalinity values ( 11.0 mg/L) observed on the mainstem river during the May sampling. The maximum recorded total alkalinity of 136. mg/L was observed at the Presquile River site during the February sampling. As would be expected due to their calcareous catchments Limestone Stream and the Presquile River exhibited the highest total alkalinities on all sampling occasions.

Figure 13 presents the spatial variation of total alkalinity of the Saint John River from Saint Francis to Grand Falls. Despite the higher total alkalinity of the Saint Francis River, there is little difference in values recorded at Saint Francis and Caron Brook. From Caron Brook to Edmundston, there is an increase in alkalinity, probably resulting from the introduction of well buffered interbasin drainage. Certainly the high total alkalinity values observed for Baker Brook would suggest that this portion of the drainage area is partially underlain by calcareous deposits.

As is the case for most of the other parameters, the Madawaska also exhibits relatively high total alkalinity, having values ranging from 35 to 56 mg/L. Once again these elevated levels are probably the result of the discharge of pulp mill effluent, and they serve to increase the alkalinity of the mainstem Saint John River. The total alkalinity at the Saint Basile station is 50 to 100% greater than that measured

upstream at Edmundston. Total alkalinity measured at Saint Leonard is not only significantly lower than that observed at Saint Basile but it is also generally lower than values measured for the four tributaries. This would suggest that there is either some unaccounted for, poorly buffered water entering the mainstem Saint John River or that there is some acidic loading which is resulting in consumption of total alkalinity. The fact that the alkalinity remains stable from Saint Leonard to Grand Falls would support the suggestion that poorly buffered water which is not sampled in the monitoring program is responsible for lowering the total alkalinity of the Saint John River at Saint Leonard.

Major Ions

The waters of the Saint John River monitoring stations have major ion chemistry which is typically dominated by calcium and bicarbonate. Concentrations of magnesium and sulphate are also high and these ions are usually the second-most dominant cation and anion respectively. Unlike many regions of the Atlantic Provinces, marine influence is minimal and thus the concentrations of sodium and chloride are low.

Although the magnitude of concentrations of the various major ions are quite different, the spatial variability for each ion is similar. Thus, only the spatial pattern for dissolved chloride will be discussed. Despite the fact that chloride is not a dominant major ion, its conservative nature makes it amenable for investigation of dilution and concentration processes within the basin. In addition, the discussion on the spatial variability of total alkalinity presented earlier gives an indication of the behaviour of a dominant, non-conservative parameter.

The spatial and temporal distribution of dissolved chloride is presented in Figure 14. Although the concentrations appear to remain stable during the period May to August, reduced discharge in October resulted in elevated levels at nearly all of the stations. Background Saint John River chloride concentrations observed at Saint Francis range from 0.7 to 1.4 mg/L. Similar concentrations were observed downstream at Clair and Caron Brook indicating minimal dilution or concentration effects. As was observed for total alkalinity, Baker Brook had slightly

higher chloride concentrations, the effects of which were observed at Edmundston. The fact that the chloride concentration at Edmundston in August was greater than that observed at Baker Brook would support the contention that concentrated water not sampled in the monitoring program is entering this portion of the Saint John River. As with most of the other parameters, pulp mill effluent discharge serves to elevate the chloride concentration of the Madawaska River which subsequently increases the levels observed in the mainstem Saint John River at Saint Basile.

It is obvious from the water quality that during May and August there was only minimal loading of pulp mill liquor effluent into the Madawaska River. This would explain the reduced chloride, sodium, sulphate, organic carbon concentrations and water colours observed for these sampling dates. However, calcium concentration and total alkalinity of the Madawaska River remained high during the May and August sampling. This would indicate that although the loading of black liquor is reduced during these times, discharge from the lime kiln and bleach plant remains unchanged. The fact that concentrations of chloride at Saint Basile during May and August are greater than those observed for the Madawaska River would suggest that most of the black liquor is entering the Saint John River directly or after treatment at Saint Basile. As would be expected, the Saint Basile station also exhibited sodium, sulphate, organic carbon concentration and water colours which are significantly greater than those observed for the Madawaska River. Below the Saint Basile monitoring station, the four tributaries served

to dilute the chloride concentration of the Saint John River. The Green, Quisibis and Siegas Rivers all exhibited chloride concentrations which were similar to values observed for the Saint John River above Edmundston. The Grand River had higher chloride concentrations, being similar to those observed at Baker Brook. Chloride concentrations observed at Saint Leonard and Grand Falls were 50% lower than those recorded at Saint Basile and were similar to the Edmundston values.

Heavy Metals

The regular Saint John River monitoring program includes the collection of samples for the determination of concentrations of lead, copper, zinc, iron, manganese, aluminum, total dissolved aluminum, cadmium and mercury. Of these cadmium, copper, lead, zinc, and mercury were without exception found at or near to the detection limit. Manganese concentrations were generally near to the detection limit with the exception of high concentrations found in the Madawaska River and the Saint John River at Saint Basile during October.

Extractable iron concentrations ranged from 0.05 to 0.97 with the highest values observed during periods of high suspended solid loads. Excluding samples with turbidity greater than 2.0 NTU results in a range of iron concentrations of 0.05 to 0.37 which is more characteristic of moderately coloured waters in this region. Although lakes and rivers in the Atlantic provinces often have a good relationship between water colour and iron concentration (Kerekes, 1973), this was not observed for the Saint John River monitoring stations. It appears that much of iron measured for the Saint John River stations is associated with sediments and materials other than coloured organic matter. Multiple regression analysis indicates that there is a good relationship ($r^2 = 0.65$) between extractable iron concentration, dissolved organic carbon and turbidity.

Extractable aluminum is found in concentrations ranging from 0.01

mg/L up to 0.37 mg/L. As was the case for extractable iron, the highest aluminum concentrations were observed during periods of high suspended solid loads. However, multiple regression analysis of extractable aluminum versus turbidity and dissolved organic carbon did not result in a high co-efficient of determination. In addition to the measurement of extractable aluminum, samples were filtered and analysed for total dissolved aluminum concentrations. Total dissolved aluminum concentrations ranged from 0.01 mg/L to 0.200 mg/L and during periods of high turbidity were generally much lower than extractable aluminum concentration. During other occasions dissolved aluminum concentrations were equal to or slightly less than the extractable values. Although the extractable aluminum concentrations are not well correlated with water colour or total organic carbon, Figure 15 indicates that there is a good relationship between dissolved aluminum and dissolved organic carbon concentration. Thus it appears that extractable aluminum concentration can be affected by suspended solid loads while dissolved aluminum is dependent on dissolved organic carbon concentration.

The spatial distribution of extractable iron and extractable aluminum are presented in Figures 16 and 17 respectively. However, as iron and aluminum behave similarly with respect to turbidity and water colour, only the extractable aluminum distribution will be discussed. The mainstem Saint John River from Saint Francis to Clair exhibits no consistent trend over the four sampling periods. It appears that the concentrations observed in the Little River have a significant influence on the levels observed at Clair. This is particularly evident

during August when elevated aluminum concentrations at Little River appear to result in significant increases in aluminum concentration in the mainstem Saint John River. The levels observed at Caron Brook were similar to those measured at Clair, once again indicating that despite the large drainage area of the Fish River, it has only a modest effect on the overall Saint John River water quality. Below Caron Brook, the Saint John River receives water from Baker Brook which on two occasions had high extractable aluminum concentrations. Despite these elevated point source loads, extractable aluminum concentrations observed at Edmundston were generally lower than those observed upstream at Caron Brook. This would suggest that the values recorded for Baker Brook are not characteristic of run-off in this portion of the basin but are the result of elevated turbidity due to the streambed construction activities observed during the period of monitoring. With the exception of the October sampling, the Madawaska River exhibited low extractable aluminum concentrations and thus tended to dilute the mainstem Saint John River. During October, increased water colour, turbidity and dissolved organic carbon concentration resulted in a concomitant increase in extractable aluminum concentration (0.370 ug/L) which in turn increased the mainstem Saint John River concentration. Extractable aluminum concentrations at Saint Leonard were generally lower than those observed at Saint Basile, even though some of the tributaries, particularly the Grand and Siegas River, exhibited high aluminum levels. It appears that the Green River plays a major role in determining the extractable aluminum concentration of the Saint John River at Saint Leonard. On the one occasion (May) when the Green River

concentration was slightly higher than the level observed at Saint Basile, a significant increase in extractable aluminum concentration of the Saint John River was observed. As was the case for most of the water quality parameters previously discussed, there was no discernable change in extractable aluminum concentration from Saint Leonard to Grand Falls.

The spatial distribution of dissolved aluminum concentration for the Saint John River monitoring stations is presented in Figure 18. Dissolved aluminum concentrations exhibit much less variation than observed for extractable aluminum. With few exceptions the tributaries had lower dissolved aluminum than observed for the mainstem and thus tend to dilute the Saint John River. From Saint Francis to Clair, dissolved aluminum concentrations remain relatively stable despite the lower levels found in the Saint Francis and Little Rivers. As was the case for extractable aluminum, there was no difference between dissolved aluminum levels at Clair and Caron Brook. At Baker Brook dissolved aluminum concentrations were much lower than mainstem river values which would support the contention that the elevated extractable aluminum concentrations observed at Baker Brook were entirely the result of local drainage basin disturbances. At Edmundston, the dissolved aluminum concentrations were consistently lower than at Caron Brook, suggesting that run-off from the Baker Brook area dilutes the mainstem Saint John River. As was observed for extractable aluminum, the Madawaska River had low dissolved aluminum concentrations and tended to dilute the mainstem river. During the October sampling, the Madawaska did have elevated

dissolved aluminum concentrations and appeared to be responsible for an increase in the mainstem Saint John River aluminum concentration. As this high value coincided with an increase in dissolved organic carbon, it is likely that a large percentage of the aluminum was bound to organic matter. Below Saint Basile the Saint John River is further diluted by incoming water from the Green and Quisibis Rivers. However, the Siegas and Grand Rivers have dissolved aluminum levels, which are similar to or greater than the mainstem Saint John River concentrations observed at Saint Basile. These four tributaries result in dissolved aluminum concentrations at Saint Leonard and Grand Falls, which are similar to or lower than those observed at Saint Basile.

Aluminum is insoluble in elemental form at near-neutral pH but many toxic aluminum salts are soluble at pH levels above 7 as well as in acidic waters. The Saint John River has an extractable aluminum safe level water quality objective of 0.1 mg/L and an acute level objective of 1.0 mg/L. However, much of the extractable aluminum observed in the Saint John River is associated with suspended sediments and thus elevated aluminum concentrations may not necessarily result in increased toxicity. To remove the influence of sediment load, it is more appropriate to relate dissolved aluminum concentration to the water quality objectives. From Figure 19, it is apparent that the 1.0 mg/L objective is met without exception while the 0.1 mg/L safe objective is exceeded on only one occasion.

Nutrients

Phosphorus is considered to be the nutrient which generally limits primary productivity of freshwater systems. However, nitrogen and to a lesser extent carbon and silica can also be the limiting nutrient.

The total phosphorus concentrations of the Saint John River monitoring stations ranged from 0.004 mg/L to 0.160 mg/L. The highest values were observed in the tributaries and were associated with high suspended solid loads, turbidity and dissolved organic carbon concentrations. The international portion of the Saint John River exhibited little total phosphorus variation (Figure 20), having similar concentrations from Saint Francis to Edmundston. The Madawaska River tended to have concentrations which were higher than those recorded for the mainstem Saint John River and thus served to elevate the concentrations recorded at Saint Basile. However, some of the increase in the mainstem total phosphorus concentration recorded at Saint Basile was undoubtedly the result of municipal discharge from the town of Edmundston. In October, the Madawaska River had a highly elevated total phosphorus concentration, corresponding to a period of high water colour and dissolved organic carbon. Below Saint Basile, the Saint John River generally had lower total phosphorus concentrations, due largely to dilution by oligotrophic Green River water. All four of the transboundary streams included in the monitoring program exhibited occasional elevated total phosphorus concentrations. This was particularly noticeable in December, 1983 which may be a response to

internal loading of phosphorus released by the mineralization of macrophytes.

Although many trophic category schemes are based on total phosphorus concentration, total phosphorus is often a poor indicator of productive potential. This is particularly true in systems with high suspended solids loads, as much of the measured phosphorus is complexed with sediment and is therefore not available to primary producers. For this reason it is common practice to measure not only total phosphorus concentration but also total dissolved and/or soluble reactive phosphorus fractions. As would be expected total dissolved phosphorus concentrations are consistently lower than total phosphorus concentrations and range from 0.001 mg/L to 0.150 mg/L. With the exception of the Madawaska River, the mainstem Saint John River and the tributaries exhibit similar concentrations (Figure 21), which are in most cases less than .010 mg/L. These low total phosphorus concentrations indicate that for the most part the International portion of the Saint John River can be considered to be oligotrophic. It appears that more than 90% of the total phosphorus measured in the Madawaska River during October was in dissolved form. However, it is probable that much of this dissolved phosphorus was bound to dissolved organic matter and would therefore have little effect on aquatic productivity. Although the effect of this high dissolved phosphorus concentration is apparent at Saint Basile, the Saint John River is back to characteristic concentrations at Saint Leonard and Grand Falls. Even though much of the phosphorus measured for these stations is apparently

associated with suspended matter, the four transboundary streams exhibit a different pattern. On several occasions, a large percentage of the phosphorus measured is in dissolved form and thus eutrophication is a potential problem. In order to prevent the establishment of nuisance conditions a water quality objective of 0.1 mgP/L for flowing streams, 0.05 mgP/L for streams entering impoundments and 0.025 mgP/L for impoundments has been established. The acute objective of 0.1 mgP/L has been met on all but one occasion. Using the more realistic objective of 0.05 mgP/L, it is apparent that there are only a few non-compliance values which were generally observed at sites where the suspended solids load were elevated. (Figure 22)

In order to use total phosphorus as an indicator of trophic status, one must assume that the system in question is indeed phosphorus limited. Although phosphorus limitation is the general rule for fresh waters in the Atlantic Region, nitrogen is occasionally the limiting nutrient. In general, the probability of nitrogen limitation is low if the N:P ratio exceeds approximately 10:1 (Vollenweider & Kerekes, 1980). For the Saint John River monitoring stations, it is apparent that although phosphorus is the dominant limiting nutrient, nitrogen limitation is observed on several occasions. (Figure 23)

Total nitrogen concentrations of the Saint John River monitoring stations range from 0.08 mg/L to 4.2 mg/L with the highest values found in the Presquile River and Limestone Brook. These two sites had high total nitrogen concentrations on all occasions, due to point source

loading from starch plants in Maine. The spatial distribution of nitrogen (Figure 24) indicates little variation of total nitrogen from Saint Francis to Edmundston. There is a slight increase in total nitrogen concentration of the Saint John River at Saint Basile, probably due to municipal discharge. However at Saint Leonard and Grand Falls, total nitrogen levels are once again similar to concentrations observed at the upstream stations.

## CONCLUSIONS AND RECOMMENDATIONS

Commencing in March of 1984, the Saint John River monitoring program was enhanced by the addition of nine new water quality stations. As a result of the sampling frequency and lack of gauging on most of the tributaries it was unrealistic to calculate chemical loadings. However, despite only four samplings of the twenty water quality stations, it is possible to investigate the spatial distribution of individual water quality parameters and identify important point sources. These results indicate that of the nine Saint John River tributaries sampled, only the Madawaska and Green Rivers have significant effects on the water quality of the Saint John River. Pulp mill effluent discharge and municipal discharge from Edmundston elevate the concentration of many water quality parameters in the Madawaska River which in turn increases the concentrations observed in the Saint John River. The water quality of the Green River is characteristically dilute and thus tends to lower the concentration of many water quality parameters in the Saint John River. Although some of the other rivers have significant water quality features which may be of local importance, they have little effect on the overall water quality of the Saint John River.

These results suggest that the present monitoring program can be significantly reduced without losing information on the factors controlling the water quality of the Saint John River. Thus the only tributaries which need to be monitored are the Green River and the

Madawaska River. In addition, the Saint John River stations at Saint Francis, Clair and Caron Brook exhibited little difference in water quality. This would suggest that only one mainstem river station is necessary for this reach. The station at Clair is preferable as it has the longest period of record and is the only station which can be easily sampled at mid-river. The two Saint John River stations located at Edmundston and Saint Basile provide useful information and thus they should remain as integral components of the monitoring program. The results of the 1984/85 monitoring program as well as historical data records (WQB, 1979) indicate little difference in the water quality of the Saint John River at Saint Leonard and at Grand Falls. Due to the fact that the Grand Falls station has a long period of record, historical AWQM data and is included in the Water Quality Branch Overview sampling program, it is felt that the Saint Leonard station should be excluded from the monitoring program. The four transboundary streams exhibit water quality characteristics which are significantly different from those of the Saint John River. High nutrient concentrations, possible eutrophication and the transboundary nature of these streams suggest they should continue as part of the monitoring program. Although the Saint Francis River appears to have little effect on the water quality of the Saint John River, it is an interprovincial river and should therefore remain in the monitoring program. Thus in summation, it appears that the minimal Saint John River monitoring program should be comprised of the eleven stations presented in Table 3.

Where appropriate, results of the 1984/85 Saint John River

monitoring program have been compared to established water quality objectives. Without exception, all parameters were either within water quality objectives or had only a few non-compliant values. Under no circumstance was there a monitoring station which consistently did not comply with any specific water quality objective.

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## LIST OF TABLES

Table 1 List of the Saint John River Sampling Stations

Table 2 List of Parameters and Parameter Codes for the Saint John River Monitoring Program

Table 3 List of Stations proposed for the Saint John River Monitoring Program

TABLE 1: LIST OF SAINT JOHN RIVER SAMPLING STATIONS

| | NAQUADAT NUMBER | STATION DESCRIPTION |
|---|---|---|
| 1 | 00NB01AD0013 | SAINT JOHN RIVER AT SAINT FRANCIS ,MAINE |
| 2 | 00NB01AD0009 | SAINT FRANCIS RIVER |
| 3 | 00NB01AD0009 | LITTLE RIVER |
| 4 | 00NB01AD0001 | SAINT JOHN RIVER AT CLAIR |
| 5 | 00NB01AD0017 | SAINT JOHN RIVER AT CARON BROOK |
| 6 | 00NB01AD0019 | BAKER BROOK |
| 7 | 00NB01AD0008 | SAINT JOHN RIVER AT EDMUNDSTON |
| 8 | 00NB01AD0016 | MADAWASKA RIVER AT EDMUNDSTON |
| 9 | 00NB01AF0019 | IROQUOIS RIVER |
| 10 | 00NB01AF0038 | SAINT JOHN RIVER AT SAINT BASILE |
| 11 | 00NB01AF0021 | GREEN RIVER |
| 12 | 00NB01AF0015 | QUISIBIS RIVER |
| 13 | 00NB01AF0014 | SIEGAS RIVER |
| 14 | 00NB01AF0023 | GRAND RIVER |
| 15 | 00NB01AF0002 | SAINT JOHN RIVER AT SAINT LEONARD |
| 16 | 01NB01AF0005 | SAINT JOHN RIVER AT GRAND FALLS |
| 17 | 00NB01AG0003 | LIMESTONE STREAM AT FOUR FALLS |
| 18 | 01NB01AG0001 | AROOSTOOK RIVER AT TINKER DAM |
| 19 | 00NB01AJ0012 | BIG PRESQUILE RIVER |
| 20 | 00NB01AJ0029 | MEDUXNEKEAG RIVER |

TABLE 2: LIST OF PARAMETERS AND PARAMETER CODES FOR THE SAINT JOHN RIVER MONITORING PROGRAM

| PARAMETER CODE | PARAMETER |
|---|---|
| 02065S | WATER TEMPERATURE |
| 08102F | DISSOLVED OXYGEN (METER) |
| 08101F | DISSOLVED OXYGEN (WINKLER) |
| 10301F | FIELD PH |
| 02042F | FIELD SPECIFIC CONDUCTANCE US/CM |
| 10301L | LABORATORY PH |
| 02041L | LAB SPECIFIC CONDUCTANCE US/CM |
| 02011L | WATER COLOUR HAZEN UNITS |
| 02073L | TURBIDITY JTU |
| 10101L | TOTAL ALKALINITY MG/L |
| 10110L | GRAN ALKALINITY MG/L |
| 20110L | DISSOLVED CALCIUM MG/L |
| 12107L | DISSOLVED MAGNESIUM MG/L |
| 19103L | DISSOLVED POTASSIUM MG/L |
| 11103L | DISSOLVED SODIUM MG/L |
| 16304L | DISSOLVED SULPHATE MG/L |
| 17205L | DISSOLVED CHLORIDE MG/L |
| 48302P | EXTRACTABLE CADMIUM MG/L |
| 82303P | EXTRACTABLE LEAD MG/L |
| 29305P | EXTRACTABLE COPPER MG/L |
| 30309P | EXTRACTABLE ZINC MG/L |
| 26304P | EXTRACTABLE IRON MG/L |
| 13305P | EXTRACTABLE ALUMINIUM MG/L |
| 25304P | EXTRACTABLE MANGANESE MG/L |
| 80314P | EXTRACTABLE MERCURY MG/L |
| 06107L | DISSOLVED ORGANIC CARBON MG/L |
| 13106L | DISSOLVED ALUMINIUM MG/L |
| 15104L | TOTAL DISSOLVED PHOSPHORUS MG/L |
| 10401L | TOTAL SUSPENDED SOLIDS MG/L |
| 06581L | HUMIC ACID MG/L |
| 07110L | NITROGEN DISSOLVED NO3 & NO2 MG/L |
| 07601L | TOTAL NITROGEN MG/L |
| 15413P | TOTAL PHOSPHORUS MG/L |

TABLE 3:LIST OF STATIONS PROPOSED FOR THE SAINT JOHN RIVER MONITORING PROGRAM

| | NAQUADAT NUMBER | STATION DESCRIPTION |
|---|---|---|
| 1 | 00NB01AD0009 | SAINT FRANCIS RIVER |
| 2 | 00NB01AD0001 | SAINT JOHN RIVER AT CLAIR |
| 3 | 00NB01AD0008 | SAINT JOHN RIVER AT EDMUNDSTON |
| 4 | 00NB01AD0016 | MADAWASKA RIVER AT EDMUNDSTON |
| 5 | 00NB01AF0038 | SAINT JOHN RIVER AT SAINT BASILE |
| 6 | 00NB01AF0021 | GREEN RIVER |
| 7 | 01NB01AF0005 | SAINT JOHN RIVER AT GRAND FALLS |
| 8 | 00NB01AG0003 | LIMESTONE STREAM AT FOUR FALLS |
| 9 | 01NB01AG0001 | AROOSTOOK RIVER AT TINKER DAM |
| 10 | 00NB01AJ0012 | BIG PRESQUILE RIVER |
| 11 | 00NB01AJ0029 | MEDUXNEKEAG RIVER |

## LIST OF FIGURES

Figure 1 Canadian Monitoring Sites in the International Portion of the Saint John River Basin

Figure 2 Seasonal Variation of Water Temperature for the Saint John River Monitoring Stations

Figure 3 Spatial Variation of Water Temperature for the Saint John River Monitoring Stations

Figure 4 Laboratory vs Field pH Values for the Saint John River Monitoring Stations

Figure 5 Seasonal Variation of pH for the Saint John River Monitoring Stations

Figure 6 Spatial Variation of Laboratory pH for the Saint John River Monitoring Stations

Figure 7 Laboratory vs Field Specific Conductance for the Saint John River Monitoring Stations

Figure 8 Spatial Variation of Laboratory Specific Conductance for the Saint John River Monitoring Stations

Figure 9 Seasonal Variation of Dissolved Oxygen for the Saint John River Monitoring Stations

Figure 10 Seasonal Variation of Dissolved Oxygen Saturation for the Saint John River Monitoring Stations

Figure 11 Spatial Variation of Water Colour for the Saint John River Monitoring Stations

Figure 12 Water Colour vs DOC for the Saint John River 1984 Monitoring Program

Figure 13 Spatial Variation of Total Alkalinity Concentration for the Saint John River Monitoring Stations

Figure 14 Spatial Variation of Chloride Concentration for the Saint John River Monitoring Stations

Figure 15 Dissolved Organic Carbon Concentration vs Dissolved Aluminum for the Saint John River Monitoring Stations

Figure 16 Spatial Variation of Extractable Iron Concentration for the Saint John River Monitoring Stations

Figure 17 Spatial Variation of Extractable Aluminum Concentration for the Saint John River Monitoring Stations

Figure 18 Spatial Variation of Dissolved Aluminum Concentrations for the Saint John River Monitoring Stations

Figure 19 Seasonal Variation of Dissolved Aluminum for the Saint John River Monitoring Stations

Figure 20 Spatial Variation of Total Phosphorus Concentration for the Saint John River Monitoring Stations

Figure 21 Spatial Variation of Total Dissolved Phosphorus Concentrations for the Saint John River Monitoring Stations

Figure 22 Seasonal Variation of Total Phosphorus for the Saint John River Monitoring Stations

Figure 23 Seasonal Variation of the N:P Ratio for the Saint John River Monitoring Stations

Figure 24 Spatial Variation of Total Nitrogen Concentration for the Saint John River Monitoring Stations

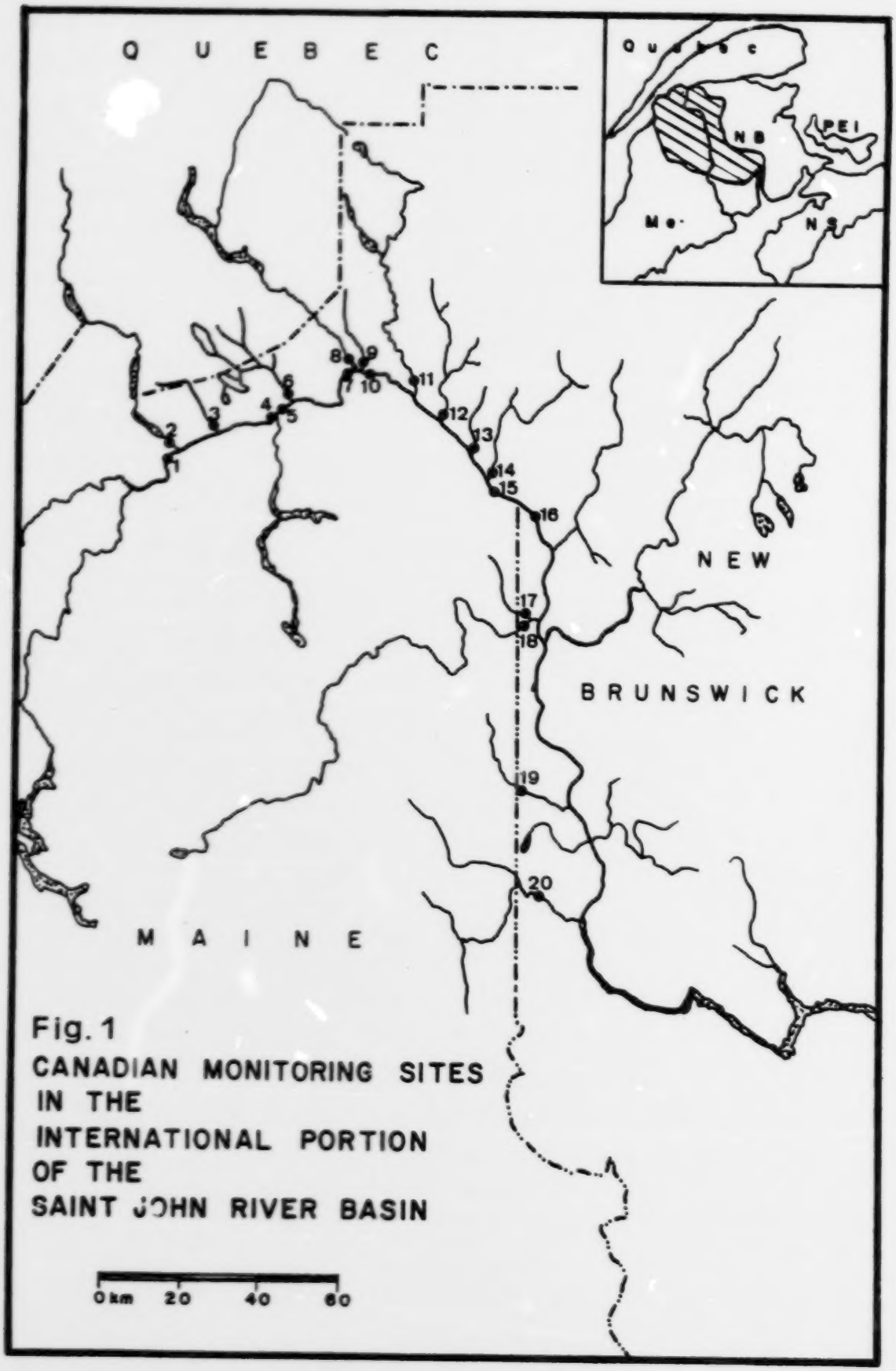



Fig. 1
CANADIAN MONITORING SITES IN THE INTERNATIONAL PORTION OF THE SAINT JOHN RIVER BASIN

FIGURE 2 :SEASONAL VARIATION OF WATER TEMPERATURE
FOR THE SAINT JOHN RIVER MONITORING STATIONS

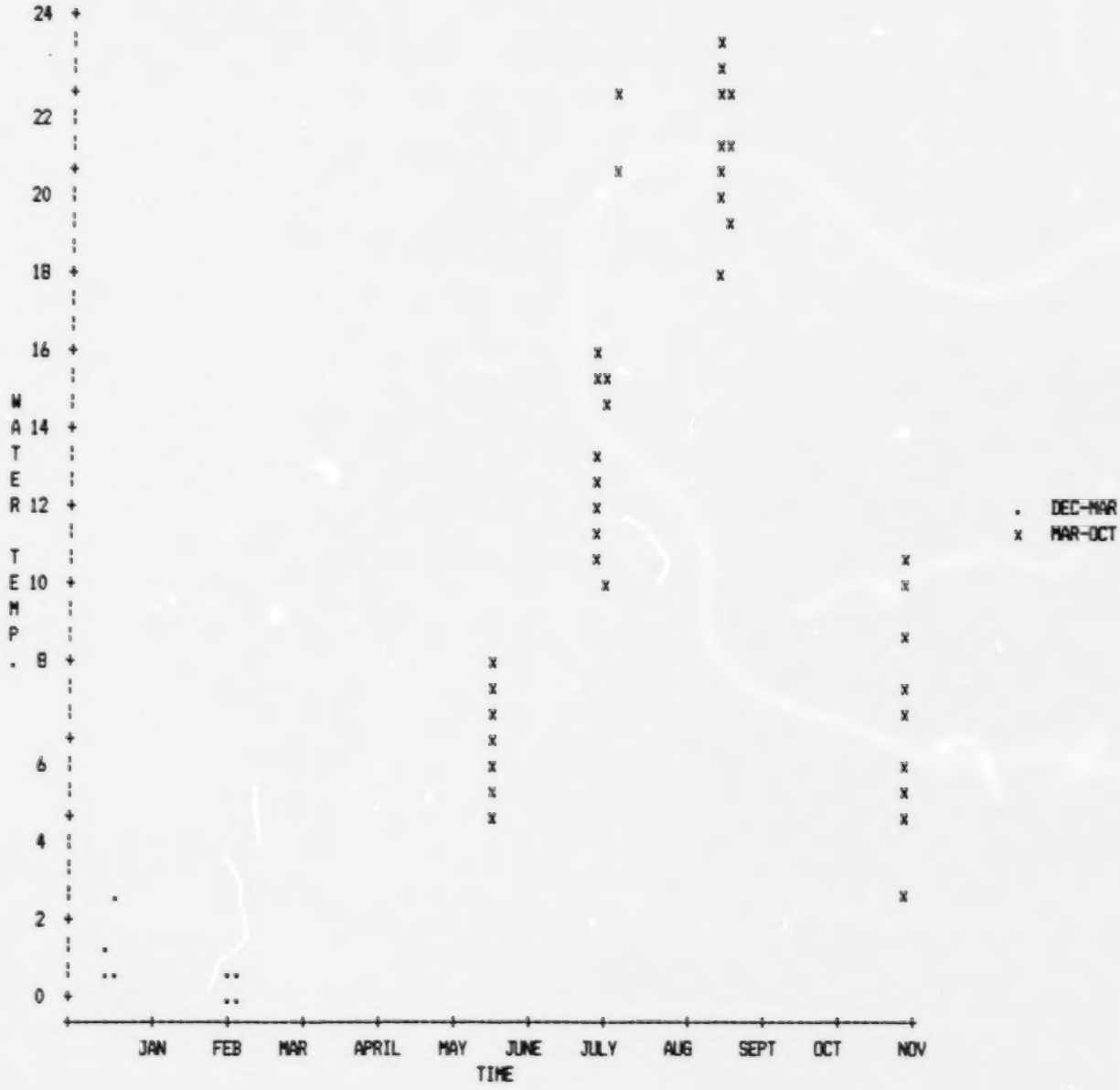


FIGURE 3

WATER TEMPERATURE DEG. C

| STATION | MAY | JUNE | AUG | OCT |
|---|---|---|---|---|
| SJR AT ST FRANCIS | 7.0 | 15.5 | 22.0 | 8.5 |
| ST FRANCIS RIVER | 5.0 | 14.4 | 20.5 | 10.0 |
| LITTLE RIVER | 5.8 | 10.3 | | 5.5 |
| SJR AT CLAIR | 6.5 | 22.0 | 21.5 | 7.0 |
| SJR AT CARON BK | 7.0 | 22.5 | 21.2 | 7.5 |
| BAKER BROOK | 6.5 | 20.0 | 18.8 | |
| SJR AT EDMUNDSTON | 6.6 | 15.5 | 23.5 | |
| MADAWASKA RIVER | 4.4 | 11.3 | 22.4 | 10.5 |
| IROQUOIS RIVER | 6.0 | 11.5 | 20.0 | 5.0 |
| SJR AT ST BASILE | 5.5 | 13.0 | 22.4 | 7.5 |
| GREEN RIVER | 5.5 | 12.2 | 20.0 | 4.0 |
| QUISIBIS RIVER | 5.3 | 10.8 | 17.6 | 4.0 |
| SIEGAS RIVER | 5.5 | 11.5 | 19.5 | 2.5 |
| GRAND RIVER | 5.5 | 10.5 | 20.5 | 4.0 |
| SJR AT ST LEONARD | 6.3 | 15.0 | 22.0 | 7.0 |
| SJR AT GRAND FALLS | 6.3 | 15.8 | | |

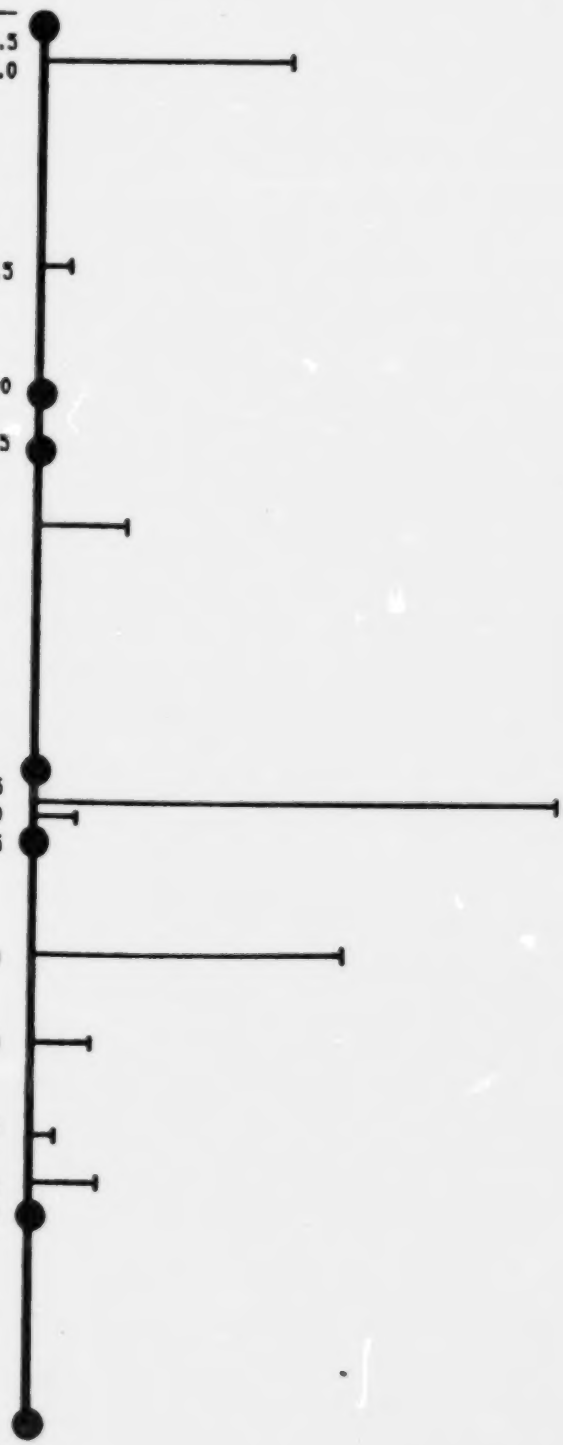


FIGURE 4 :LABORATORY VS FIELD PH VALUES FOR THE
SAINT JOHN RIVER MONITORING STATIONS

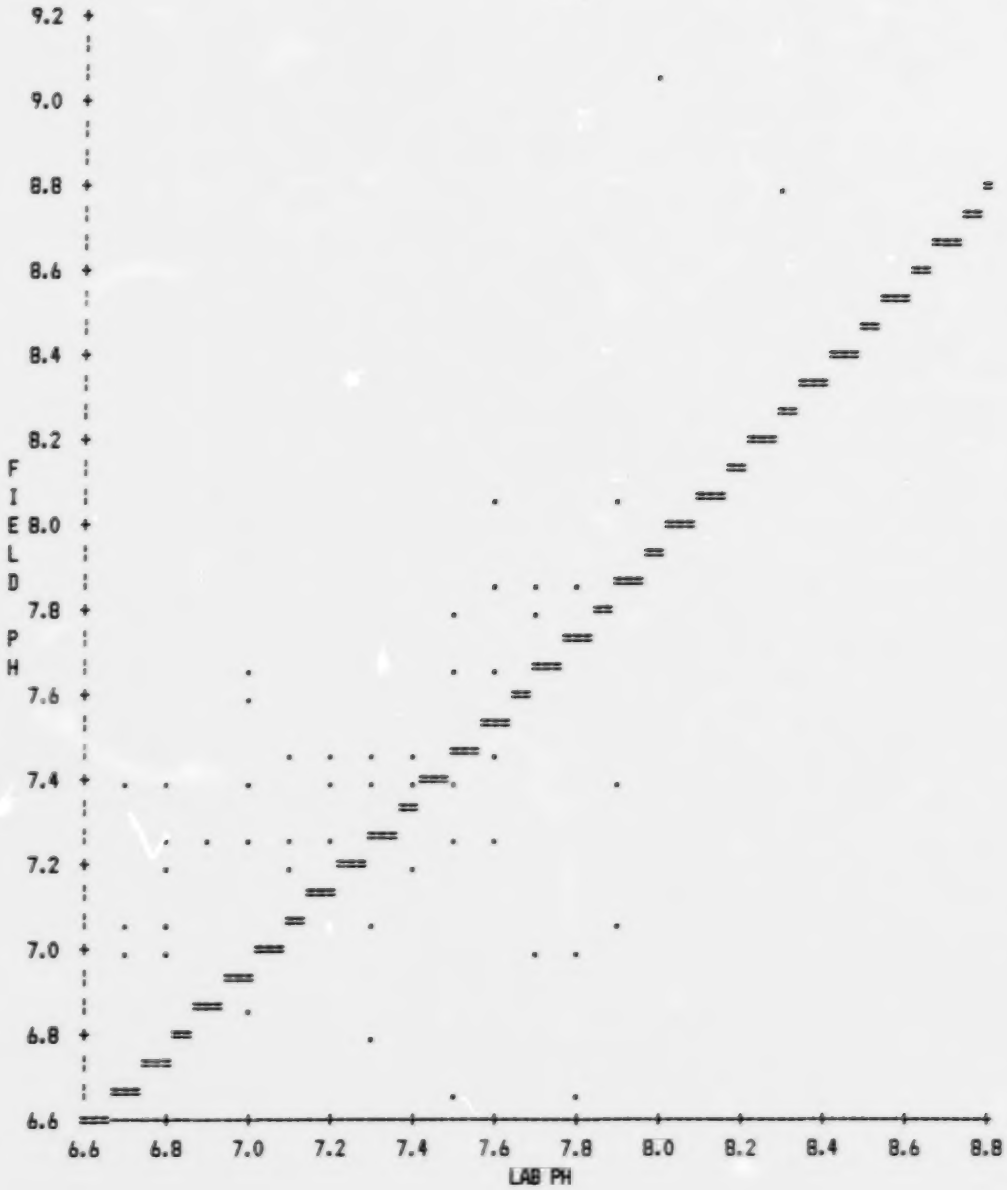


FIGURE 5 :SEASONAL VARIATION OF PH FOR THE
SAINT JOHN RIVER MONITORING STATIONS

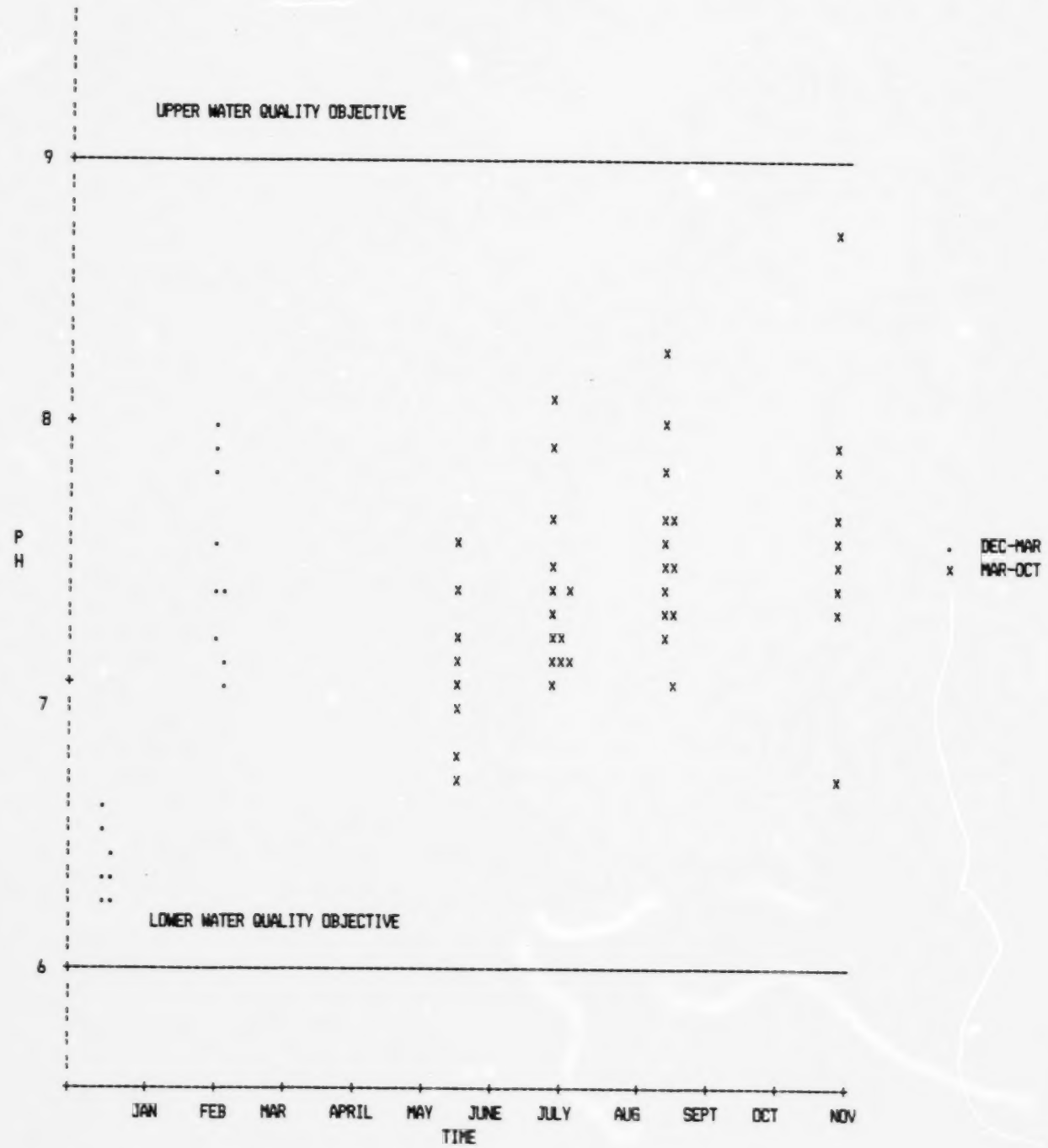


FIGURE 6

LABORATORY PH

| STATION | MAY | JUNE | AUG | OCT |
|---|---|---|---|---|
| SJR AT ST FRANCIS | 6.7 | 7.1 | 7.0 | 7.6 |
| ST FRANCIS RIVER | 6.7 | 7.2 | 7.5 | 7.3 |
| LITTLE RIVER | 6.7 | 7.1 | 7.7 | 7.8 |
| SJR AT CLAIR | 6.7 | 7.1 | 7.2 | 7.4 |
| SJR AT CARON BK | 6.7 | 7.1 | 7.3 | 7.5 |
| BAKER BROOK | 6.9 | 7.4 | 7.5 | |
| SJR AT EDMUNDSTON | 6.7 | 7.2 | 7.5 | |
| MADAWASKA RIVER | 7.2 | 7.0 | 7.6 | 6.7 |
| IROQUOIS RIVER | 6.7 | 7.1 | 7.5 | 7.4 |
| SJR AT ST BASILE | 6.8 | 7.1 | 7.3 | 7.6 |
| GREEN RIVER | 6.8 | 7.5 | 7.6 | 7.9 |
| QUISIBIS RIVER | 6.7 | 7.0 | 7.3 | 7.7 |
| SIEGAS RIVER | 6.8 | 7.4 | 7.7 | 7.9 |
| GRAND RIVER | 6.9 | 7.2 | 7.8 | 7.9 |
| SJR AT ST LEONARD | 6.8 | 7.2 | 7.4 | 7.8 |
| SJR AT GRAND FALLS | 6.7 | 7.1 | | 7.5 |

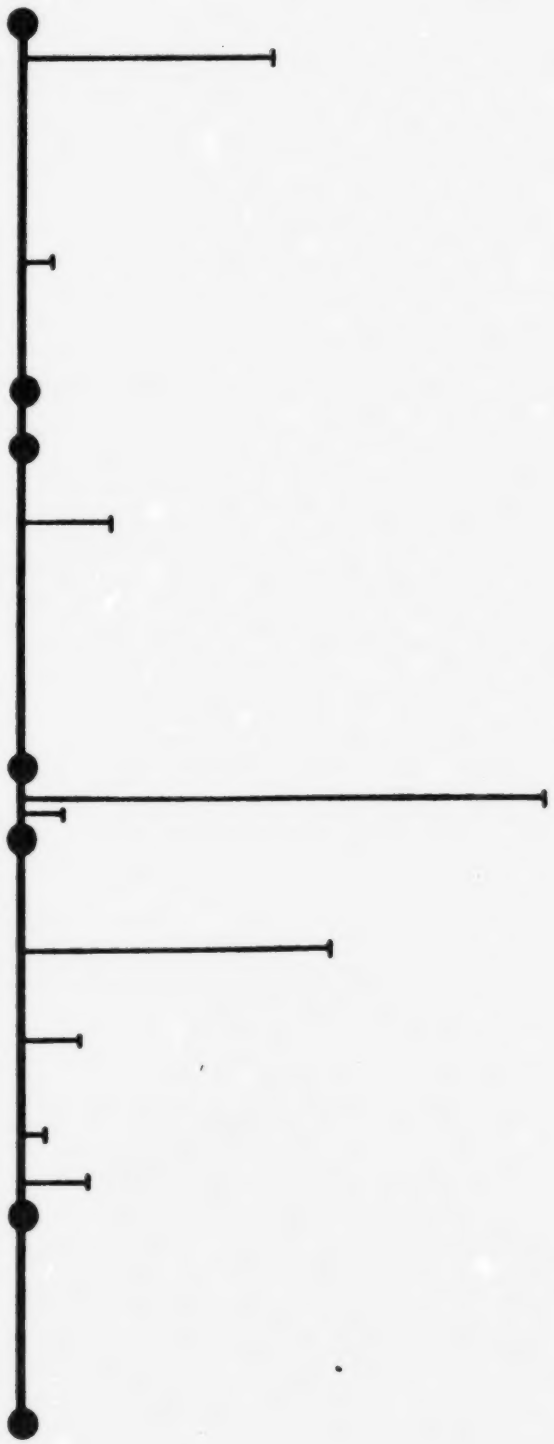


FIGURE 7 :LABORATORY VS FIELD SPECIFIC CONDUCTANCE FOR THE SAINT JOHN RIVER MONITORING STATIONS

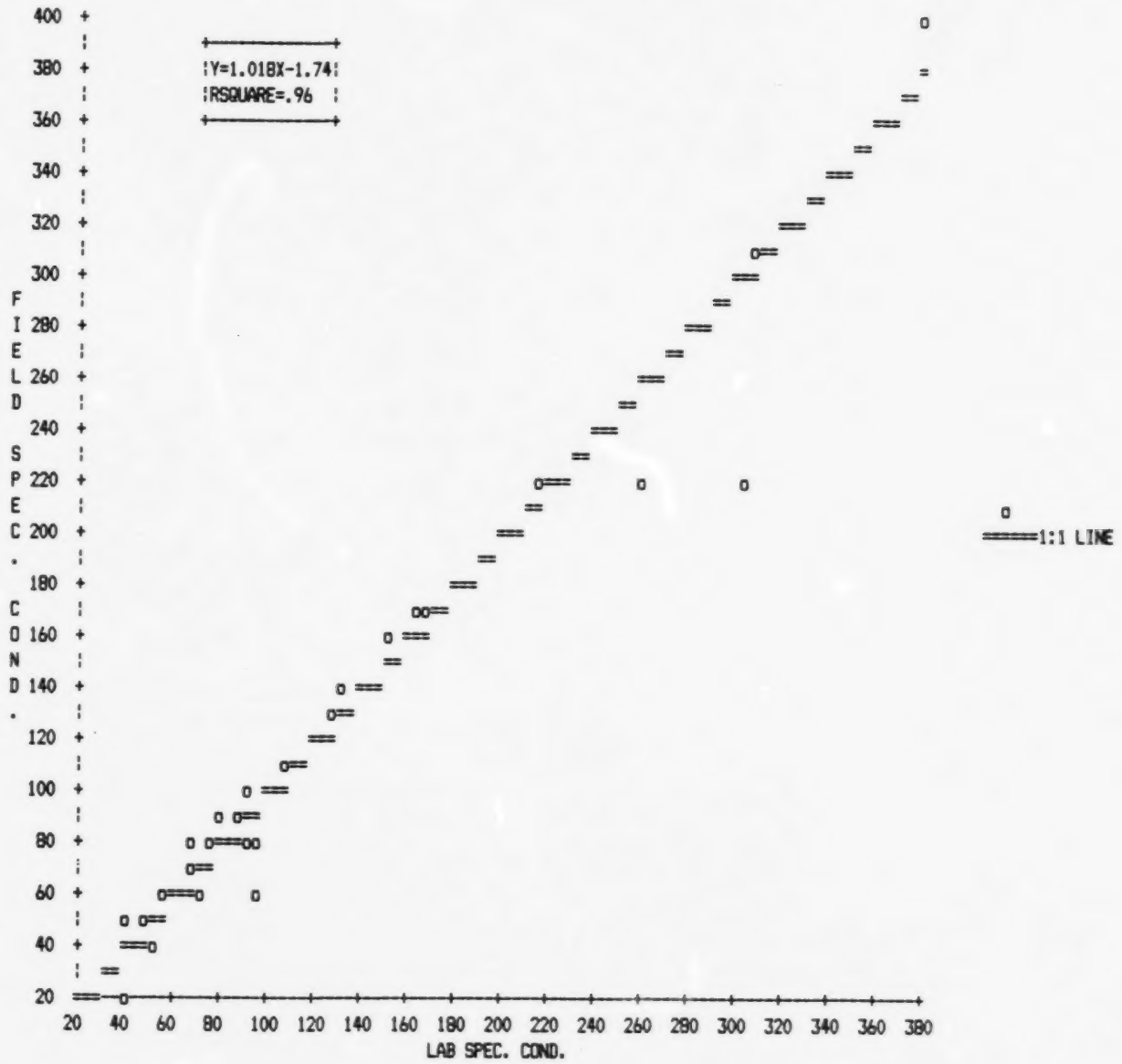


FIGURE 8

LAB SPECIFIC CONDUCTANCE

| STATION | MAY | JUNE | AUG | OCT |
|---|---|---|---|---|
| SJR AT ST FRANCIS | 41 | 44 | 56 | 70 |
| ST FRANCIS RIVER | 61 | 67 | 77 | 80 |
| LITTLE RIVER | 39 | 60 | 67 | 80 |
| SJR AT CLAIR | 39 | 49 | 56 | 69 |
| SJR AT CARON BK | 39 | 50 | 57 | 69 |
| BAKER BROOK | 76 | 92 | 79 | |
| SJR AT EDMUNDSTON | 44 | 58 | 71 | |
| MADAWASKA RIVER | 122 | 162 | 123 | 378 |
| IROQUOIS RIVER | 56 | 70 | 89 | 90 |
| SJR AT ST BASILE | 91 | 96 | 131 | 169 |
| GREEN RIVER | 66 | 81 | 91 | 103 |
| QUISIBIS RIVER | 43 | 55 | 84 | 86 |
| SIEGAS RIVER | 69 | 71 | 144 | 143 |
| GRAND RIVER | 72 | 67 | 126 | 172 |
| SJR AT ST LEONARD | 60 | 81 | 94 | 113 |
| SJR AT GRAND FALLS | 59 | 76 | | 119 |

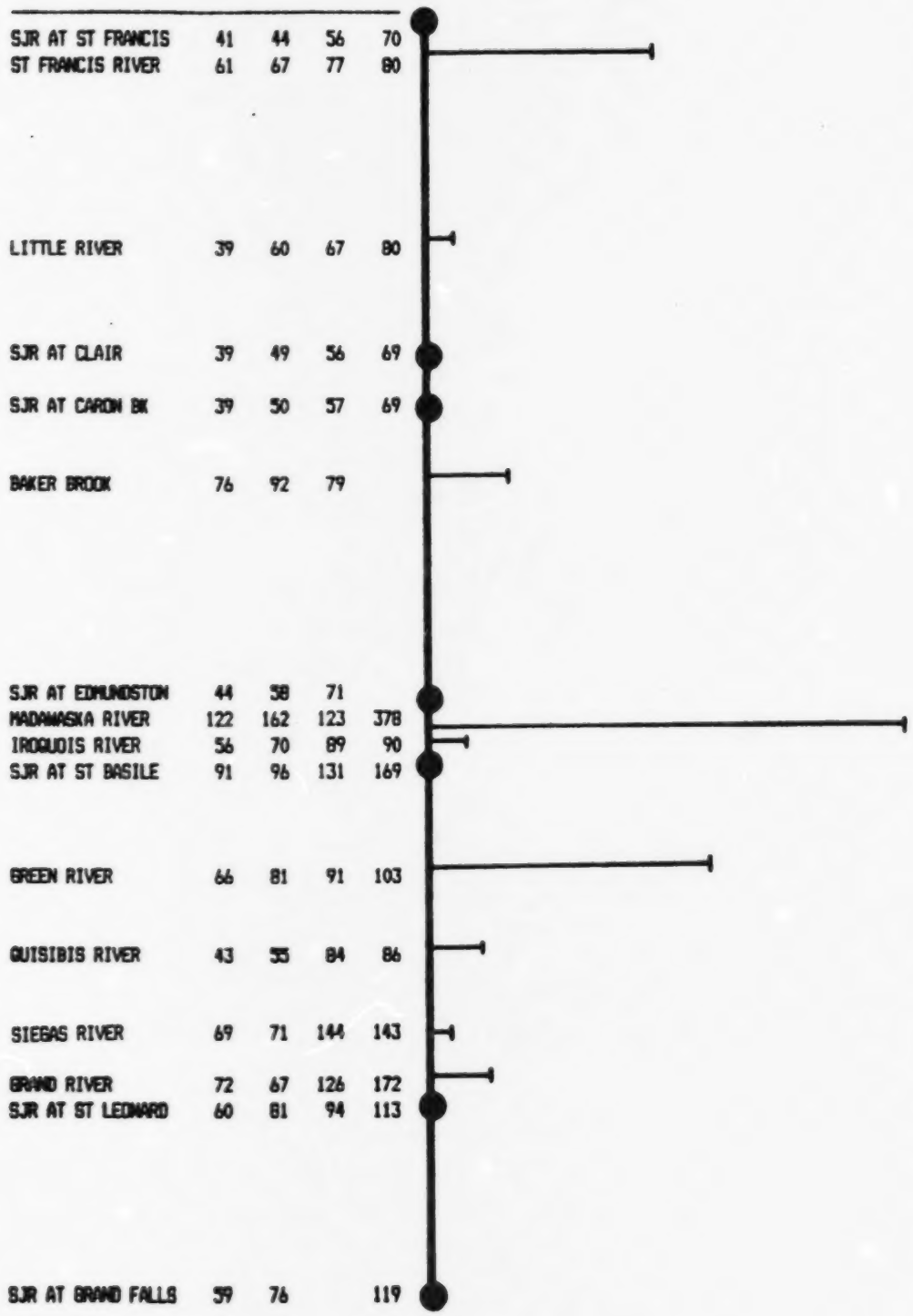


FIGURE 9 :SEASONAL VARIATION OF DISSOLVED OXYGEN
FOR THE SAINT JOHN RIVER MONITORING STATIONS

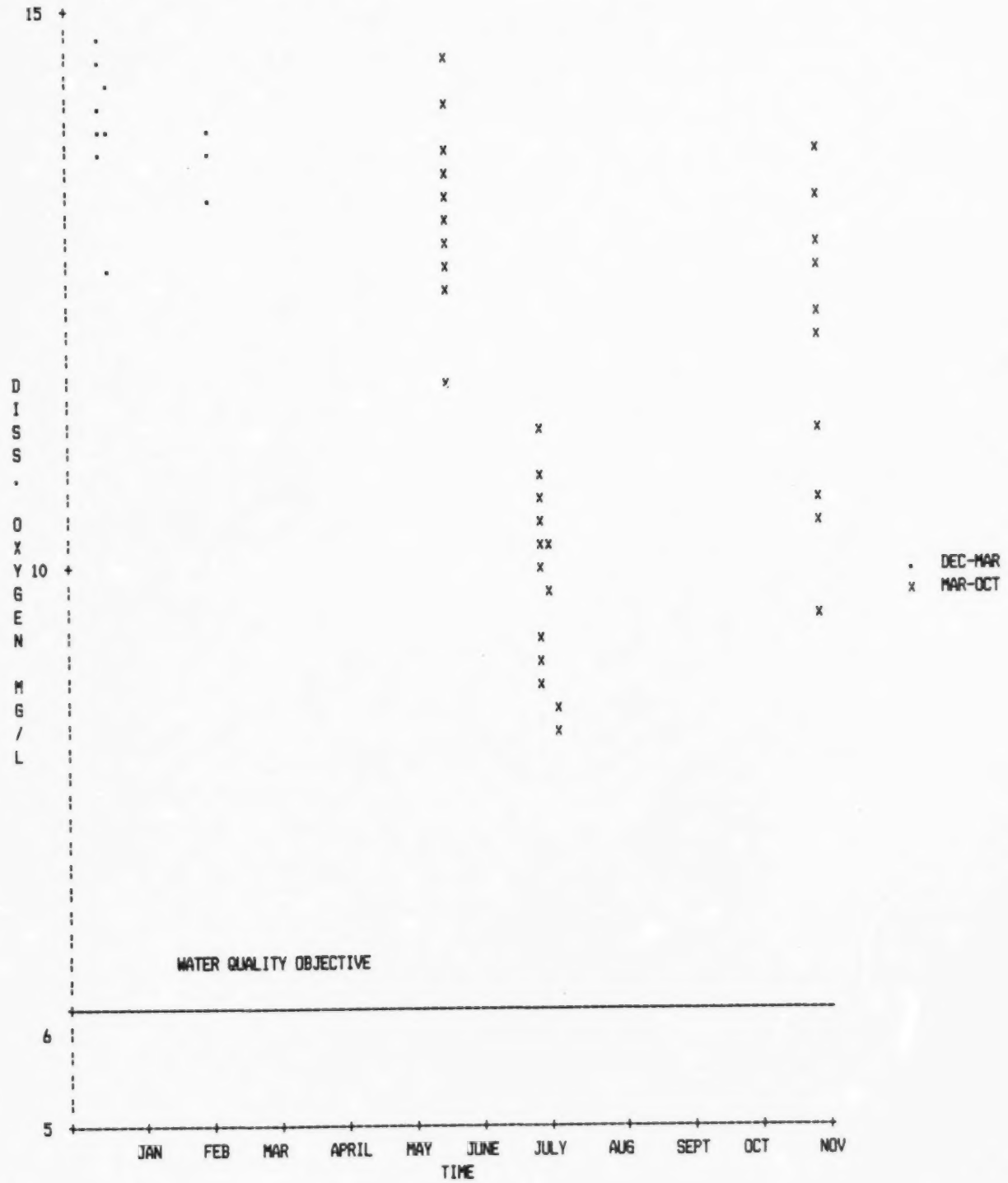


FIGURE 10: SEASONAL VARIATION OF DISSOLVED OXYGEN SATURATION FOR THE SAINT JOHN RIVER MONITORING STATIONS

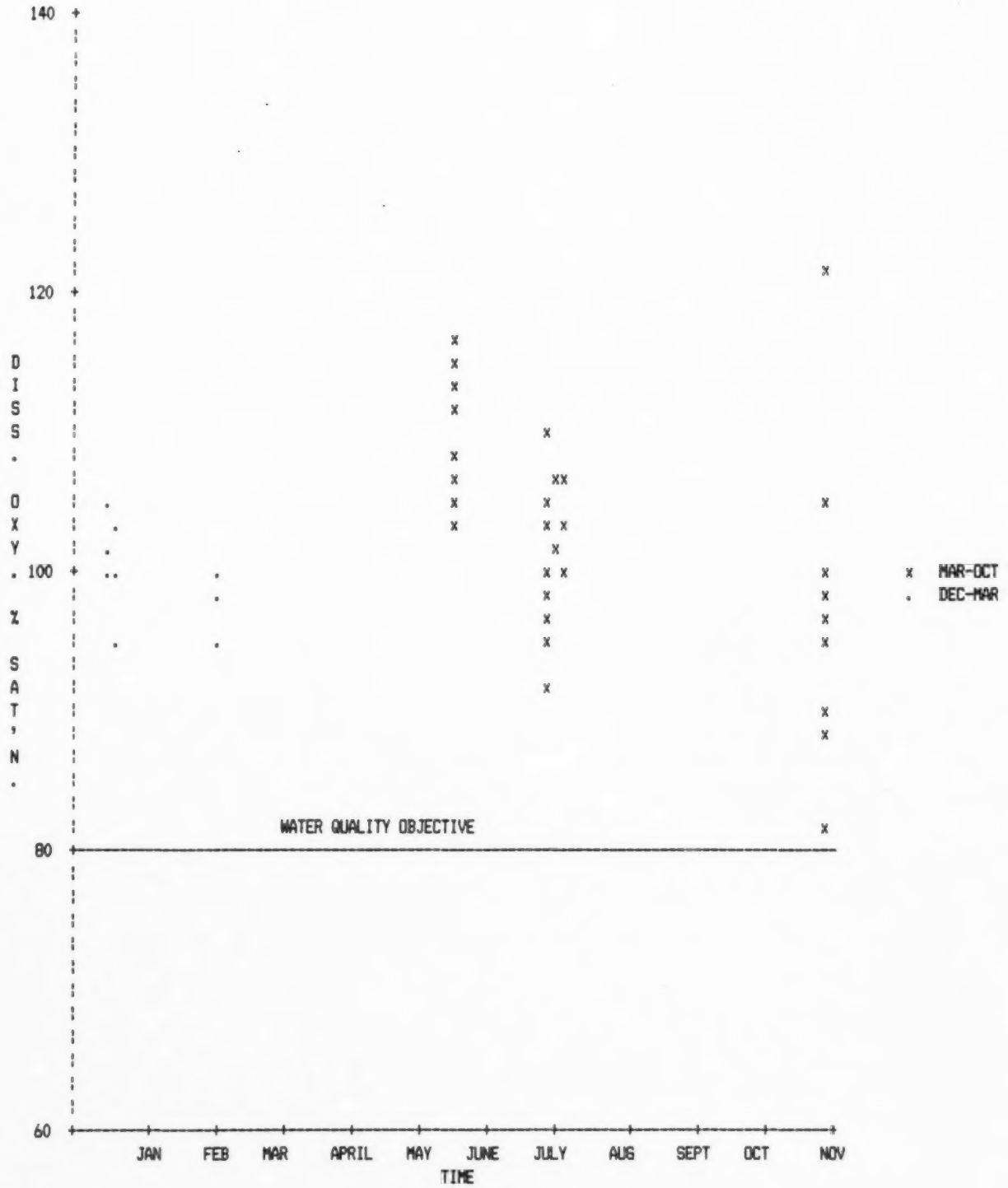


FIGURE 11

WATER COLOUR

| STATION | MAY | JUNE | AUG | OCT |
|---|---|---|---|---|
| SJR AT ST FRANCIS | 45 | 75 | 50 | 30 |
| ST FRANCIS RIVER | 45 | 30 | 35 | 20 |
| LITTLE RIVER | 20 | 20 | | 5 |
| SJR AT CLAIR | 50 | 45 | 70 | 35 |
| SJR AT CARON BX | 55 | 50 | 70 | 35 |
| BAKER BROOK | 15 | 5 | 80 | |
| SJR AT EDMUNDSTON | 40 | 40 | 45 | |
| MADAWASKA RIVER | 15 | 70 | 10 | 120 |
| IROQUOIS RIVER | 25 | 40 | 10 | 10 |
| SJR AT ST BASILE | 30 | 50 | 40 | 60 |
| GREEN RIVER | 10 | 5 | 5 | 5 |
| QUISIBIS RIVER | 20 | 45 | 10 | 5 |
| SIEGAS RIVER | 30 | 75 | 50 | 10 |
| GRAND RIVER | 45 | 90 | 50 | 10 |
| SJR AT ST LEONARD | 35 | 35 | 30 | 45 |
| SJR AT GRAND FALLS | 35 | 40 | | 40 |

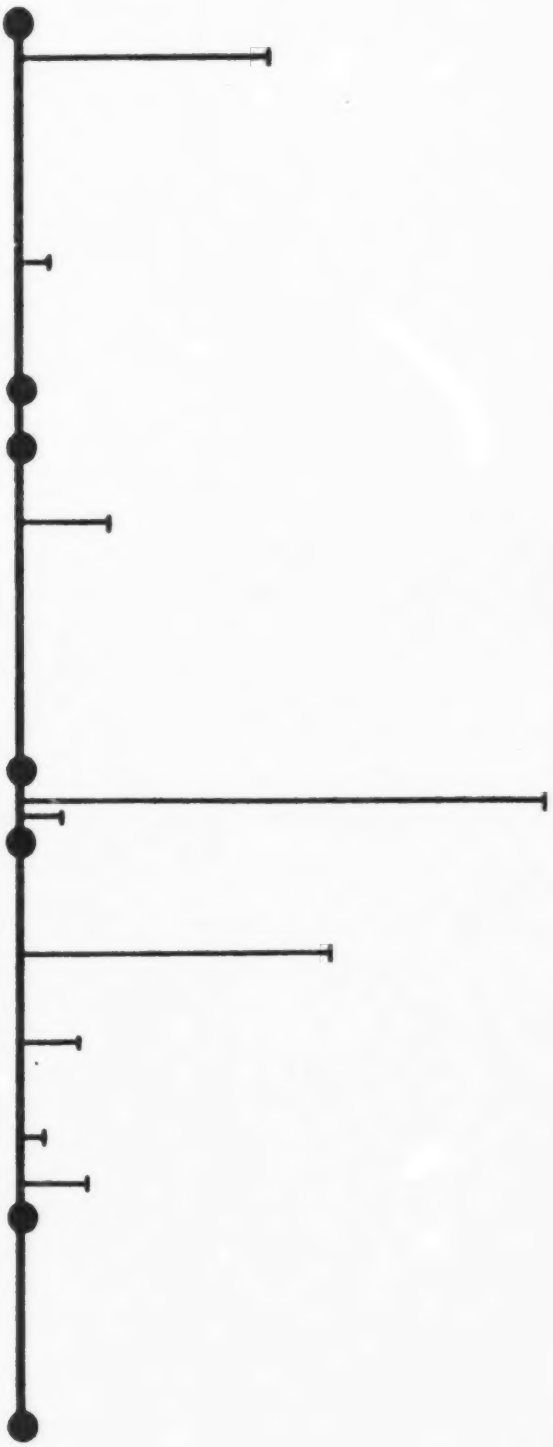


FIGURE 12 : WATER COLOUR VERSUS DOC FOR THE SAINT JOHN RIVER 1984 MONITORING PROGRAM

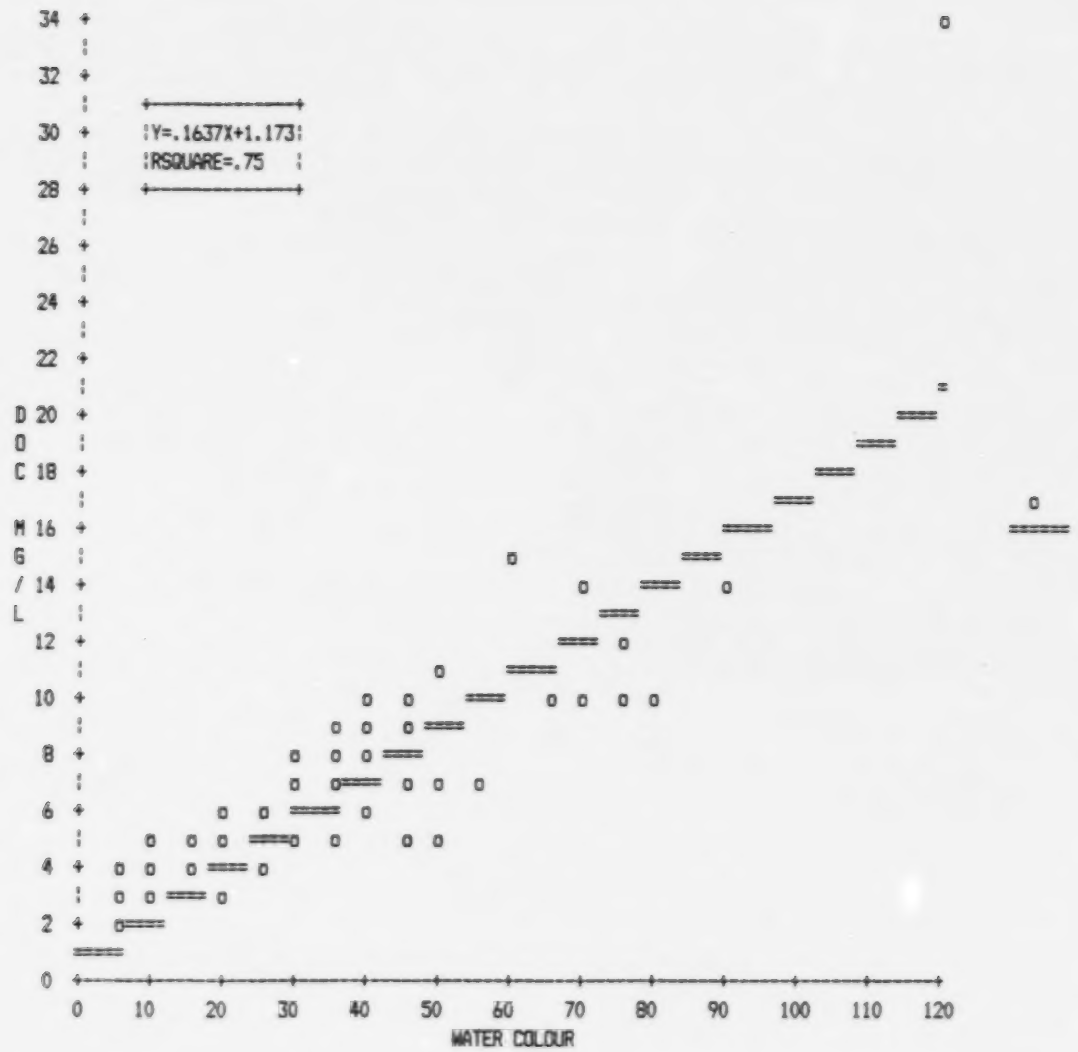


FIGURE 13

TOTAL ALKALINITY

| STATION | MAY | JUNE | AUG | OCT |
|---|---|---|---|---|
| SJR AT ST FRANCIS | 12.1 | 14.7 | 19.7 | 22.8 |
| ST FRANCIS RIVER | 19.4 | 23.9 | 29.2 | 28.8 |
| LITTLE RIVER | 12.6 | 23.3 | 25.6 | 31.8 |
| SJR AT CLAIR | 11.4 | 16.6 | 19.4 | 23.9 |
| SJR AT CARON BK | 11.2 | 17.0 | 19.6 | 23.8 |
| BAKER BROOK | 29.3 | 37.1 | 30.5 | |
| SJR AT EDMUNDSTON | 13.1 | 19.9 | 24.6 | |
| MADAWASKA RIVER | 50.0 | 35.7 | 49.5 | 56.1 |
| IROQUOIS RIVER | 18.1 | 27.1 | 35.7 | 33.9 |
| SJR AT ST BASILE | 32.2 | 29.5 | 39.8 | 36.4 |
| GREEN RIVER | 25.0 | 33.6 | 37.9 | 42.9 |
| QUISIBIS RIVER | 14.5 | 20.6 | 33.7 | 34.0 |
| SIEGAS RIVER | 26.5 | 29.5 | 64.0 | 61.3 |
| GRAND RIVER | 26.9 | 26.0 | 35.2 | 72.7 |
| SJR AT ST LEONARD | 20.0 | 27.7 | 33.0 | 32.3 |
| SJR AT GRAND FALLS | 20.2 | 25.7 | | 33.9 |

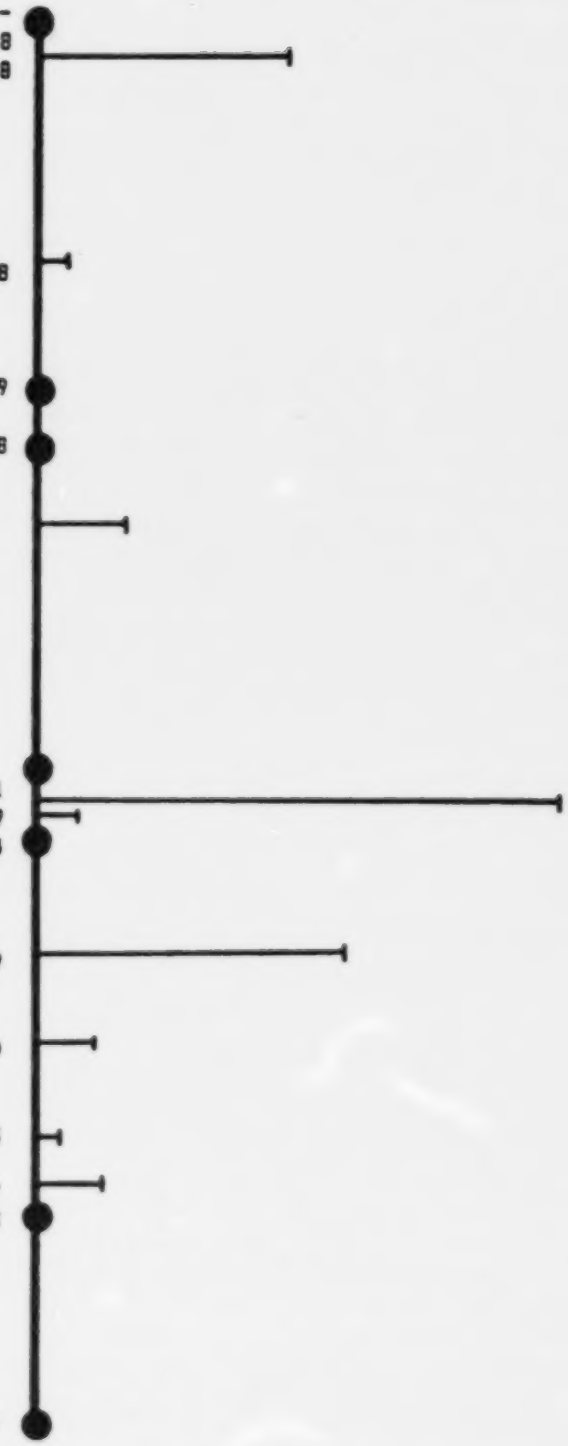


FIGURE 14

DISSOLVED CHLORIDE MG/L

| STATION | MAY | JUNE | AUG | OCT |
|---|---|---|---|---|
| SJR AT ST FRANCIS | 0.7 | 0.5 | 0.5 | 1.4 |
| ST FRANCIS RIVER | 1.5 | 1.3 | 0.9 | 1.1 |
| LITTLE RIVER | 0.5 | 0.6 | 0.5 | 1.0 |
| SJR AT CLAIR | 0.7 | 0.6 | 0.5 | 1.3 |
| SJR AT CARON BK | 0.8 | 0.8 | 0.6 | 1.2 |
| BAKER BROOK | 1.6 | 1.8 | 1.0 | |
| SJR AT EDMUNDSTON | 1.0 | 1.8 | 1.5 | |
| MADAWASKA RIVER | 2.1 | 9.6 | 1.8 | 30.0 |
| IROQUOIS RIVER | 0.9 | 1.0 | 0.8 | 1.5 |
| SJR AT ST BASILE | 2.4 | 3.7 | 4.3 | 8.2 |
| GREEN RIVER | 0.6 | 0.6 | 0.5 | 0.6 |
| QUISIBIS RIVER | 0.9 | 0.7 | 0.9 | 1.1 |
| SIEGAS RIVER | 1.0 | 0.5 | 0.7 | 1.3 |
| GRAND RIVER | 1.9 | 1.3 | 1.4 | 2.5 |
| SJR AT ST LEONARD | 1.2 | 2.1 | 2.0 | 4.3 |
| SJR AT GRAND FALLS | 1.3 | 2.2 | | 5.0 |

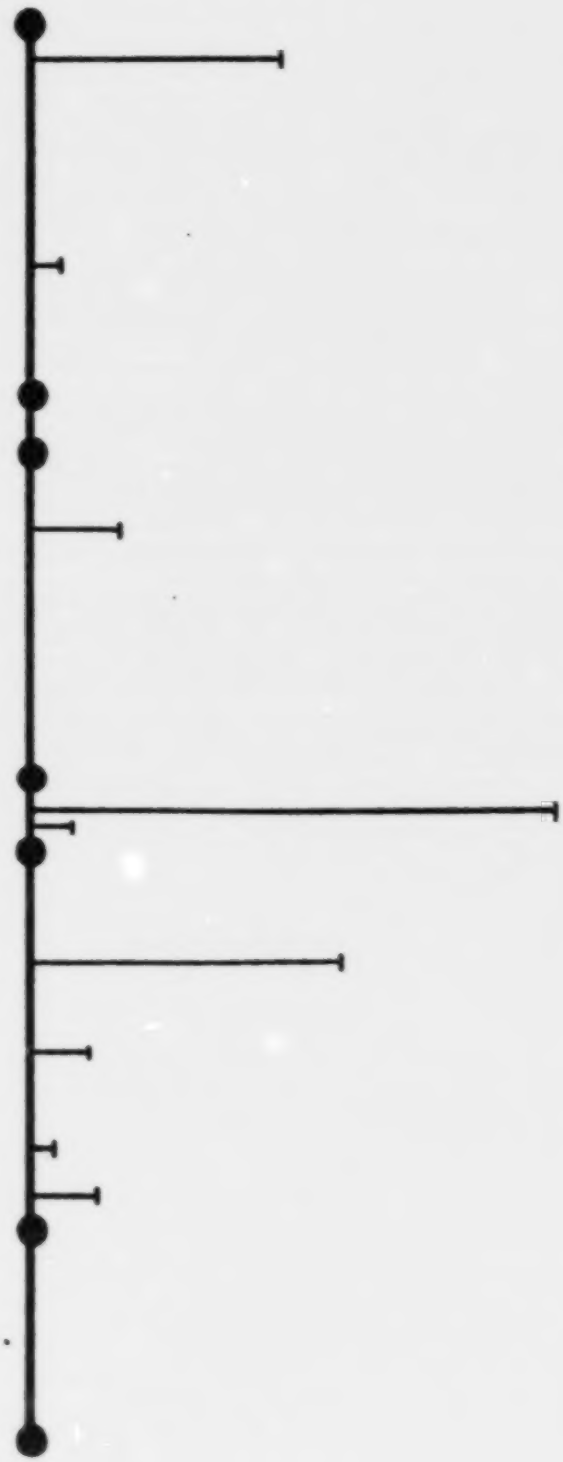


FIGURE 15 :DISSOLVED ORGANIC CARBON CONCENTRATION VS
DISSOLVED ALUMINIUM FOR THE SAINT JOHN RIVER
MONITORING STATIONS

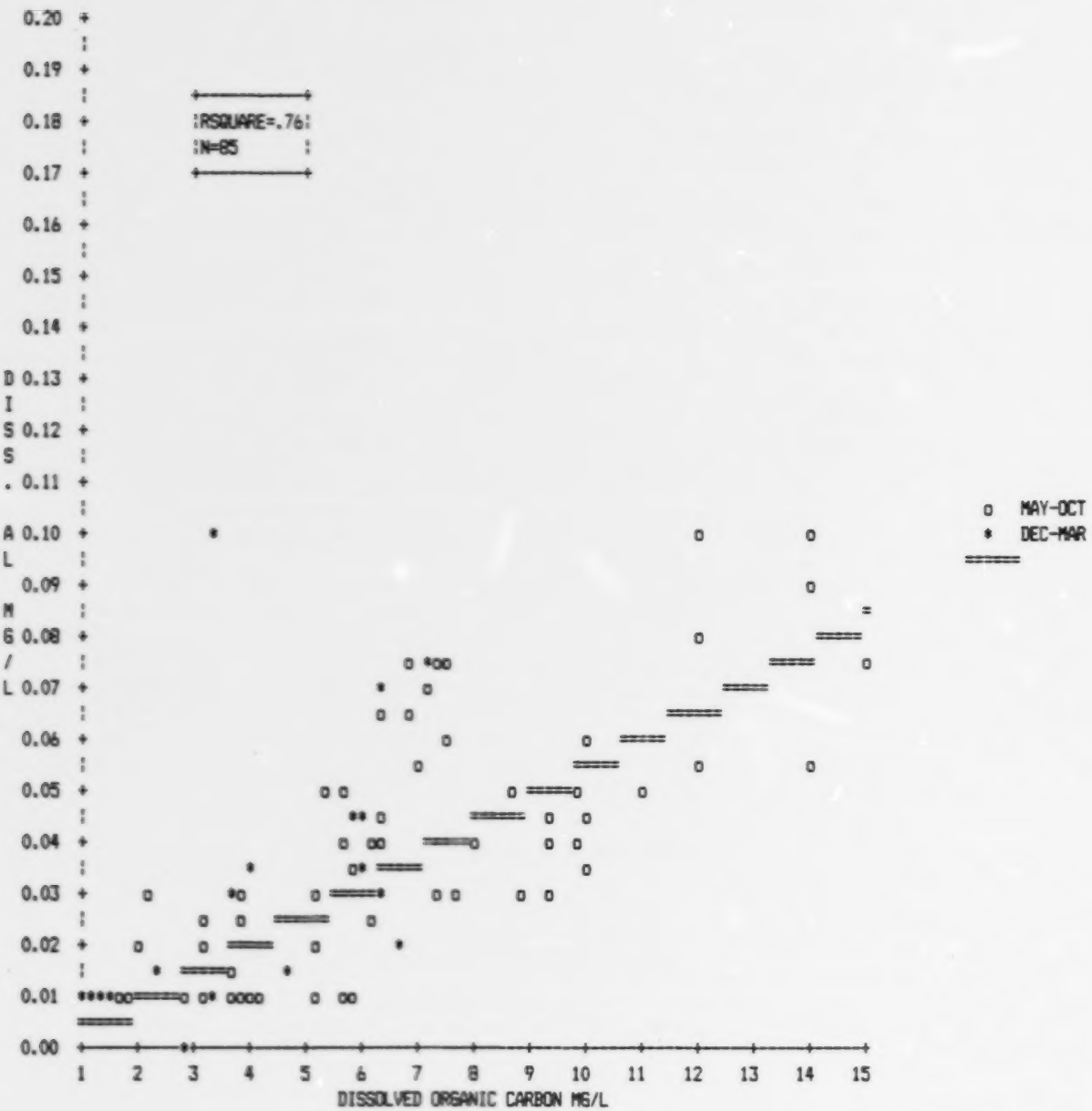


FIGURE 16

EXTRACTABLE IRON MG/L

| STATION | MAY | JUNE | AUG | OCT |
|---|---|---|---|---|
| SJR AT ST FRANCIS | 0.12 | 0.19 | 0.12 | 0.10 |
| ST FRANCIS RIVER | 0.15 | 0.06 | 0.09 | 0.05 |
| LITTLE RIVER | 0.13 | 0.10 | 0.19 | 0.06 |
| SJR AT CLAIR | 0.12 | 0.13 | 0.21 | 0.14 |
| SJR AT CARON BK | 0.14 | 0.13 | 0.20 | 0.12 |
| BAKER BROOK | 0.37 | 0.11 | 0.40 | |
| SJR AT EDMUNDSTON | 0.12 | 0.15 | 0.15 | |
| MADAWASKA RIVER | 0.07 | 0.26 | 0.10 | 0.38 |
| IROQUOIS RIVER | 0.15 | 0.24 | 0.14 | 0.22 |
| SJR AT ST BASILE | 0.12 | 0.23 | 0.16 | 0.31 |
| GREEN RIVER | 0.12 | 0.06 | 0.06 | |
| QUISIBIS RIVER | 0.15 | 0.58 | 0.21 | 0.16 |
| SIEGAS RIVER | 0.10 | 0.39 | 0.39 | 0.19 |
| GRAND RIVER | 0.27 | 0.96 | 0.28 | 0.17 |
| SJR AT ST LEONARD | 0.18 | 0.14 | 0.14 | 0.19 |
| SJR AT GRAND FALLS | 0.18 | 0.17 | | 0.18 |

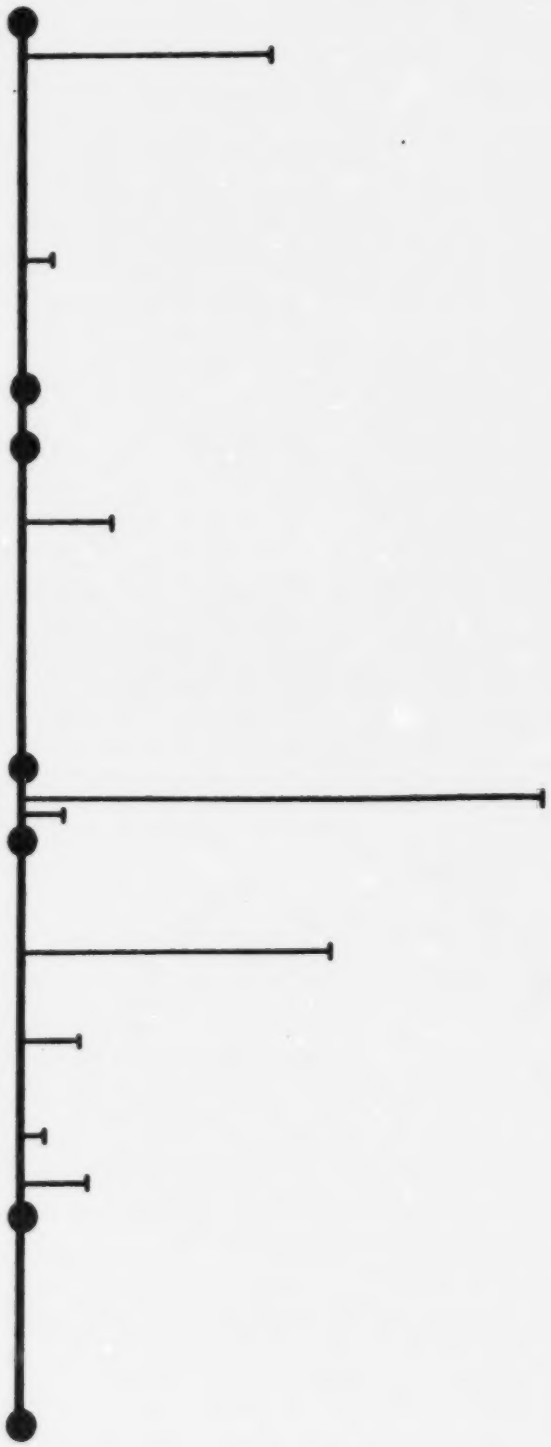


FIGURE 17

EXTRACTABLE ALUMINIUM MG/L

| STATION | MAY | JUNE | AUG | OCT |
|---|---|---|---|---|
| SJR AT ST FRANCIS | 0.100 | 0.080 | 0.065 | 0.050 |
| ST FRANCIS RIVER | 0.110 | 0.030 | 0.040 | 0.030 |
| LITTLE RIVER | 0.110 | 0.010 | 0.130 | 0.015 |
| SJR AT CLAIR | 0.110 | 0.040 | 0.110 | 0.050 |
| SJR AT CARON BK | 0.130 | 0.050 | 0.100 | 0.041 |
| BAKER BROOK | 0.230 | 0.010 | 0.280 | |
| SJR AT EDMUNDSTON | 0.120 | 0.040 | 0.077 | |
| MADAWASKA RIVER | 0.040 | 0.050 | 0.030 | 0.370 |
| IROQUOIS RIVER | 0.100 | 0.040 | 0.036 | 0.070 |
| SJR AT ST BASILE | 0.084 | 0.040 | 0.065 | 0.140 |
| GREEN RIVER | 0.088 | 0.023 | 0.030 | 0.010 |
| QUISIBIS RIVER | 0.097 | 0.060 | 0.083 | 0.035 |
| SIEGAS RIVER | 0.084 | 0.060 | 0.310 | 0.044 |
| GRAND RIVER | 0.200 | 0.100 | 0.100 | 0.075 |
| SJR AT ST LEONARD | 0.130 | 0.050 | 0.051 | 0.092 |
| SJR AT GRAND FALLS | 0.140 | 0.060 | | 0.083 |

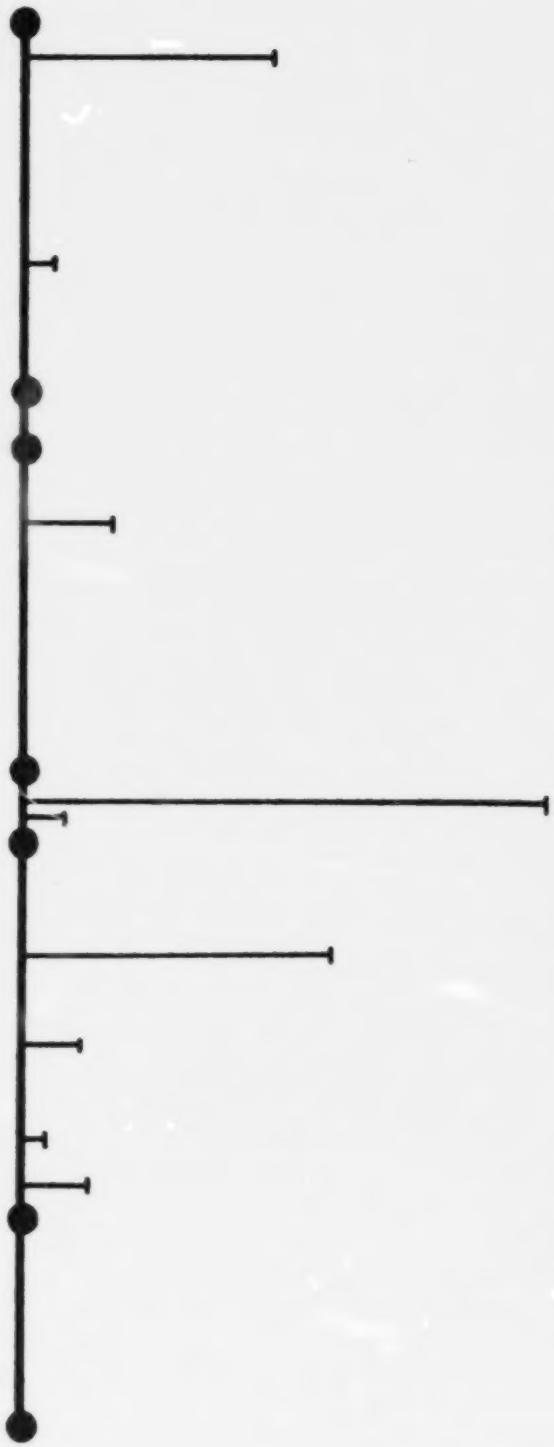


FIGURE 18

DISSOLVED ALUMINIUM MG/L

| STATION | MAY | JUNE | AUG | OCT |
|---|---|---|---|---|
| SJR AT ST FRANCIS | 0.077 | 0.080 | 0.050 | 0.040 |
| ST FRANCIS RIVER | 0.037 | 0.030 | 0.030 | 0.012 |
| LITTLE RIVER | 0.029 | 0.010 | 0.046 | 0.010 |
| SJR AT CLAIR | 0.077 | 0.040 | 0.054 | 0.032 |
| SJR AT CARON BK | 0.072 | 0.050 | 0.058 | 0.032 |
| BAKER BROOK | 0.016 | 0.010 | 0.036 | |
| SJR AT EDMUNDSTON | 0.065 | 0.040 | 0.030 | |
| MADAWASKA RIVER | 0.010 | 0.050 | 0.010 | 0.200 |
| IROQUOIS RIVER | 0.027 | 0.040 | 0.012 | 0.010 |
| SJR AT ST BASILE | 0.032 | 0.040 | 0.043 | 0.077 |
| GREEN RIVER | 0.013 | 0.023 | 0.012 | 0.010 |
| QUISIBIS RIVER | 0.025 | 0.060 | 0.010 | 0.010 |
| SIEGAS RIVER | 0.032 | 0.060 | 0.022 | 0.010 |
| GRAND RIVER | 0.050 | 0.100 | 0.045 | 0.010 |
| SJR AT ST LEONARD | 0.050 | 0.050 | 0.033 | 0.042 |
| SJR AT GRAND FALLS | 0.045 | 0.060 | | 0.045 |

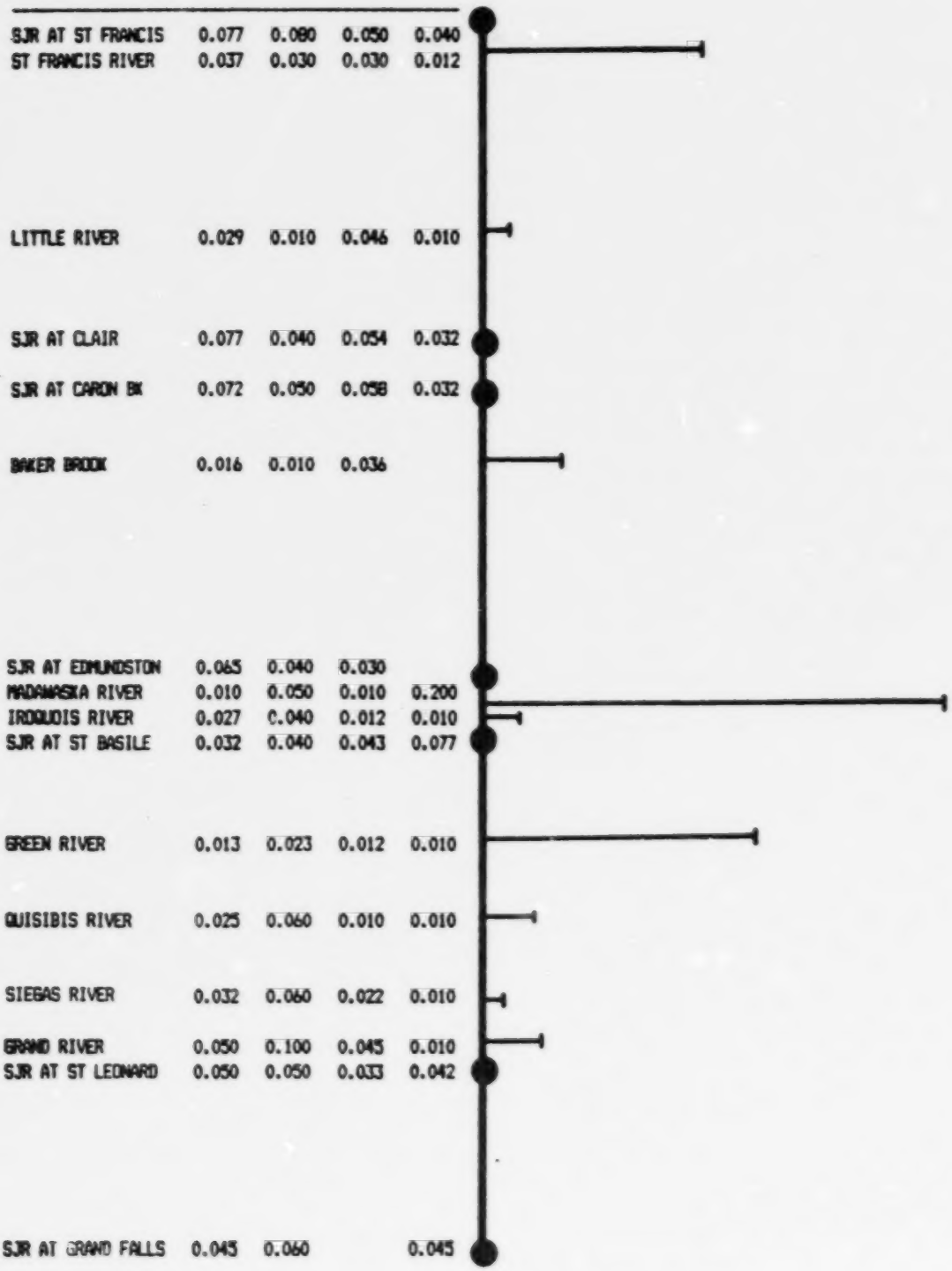


FIGURE 19: SEASONAL VARIATION OF DISSOLVED ALUMINIUM
FOR THE SAINT JOHN RIVER MONITORING STATIONS

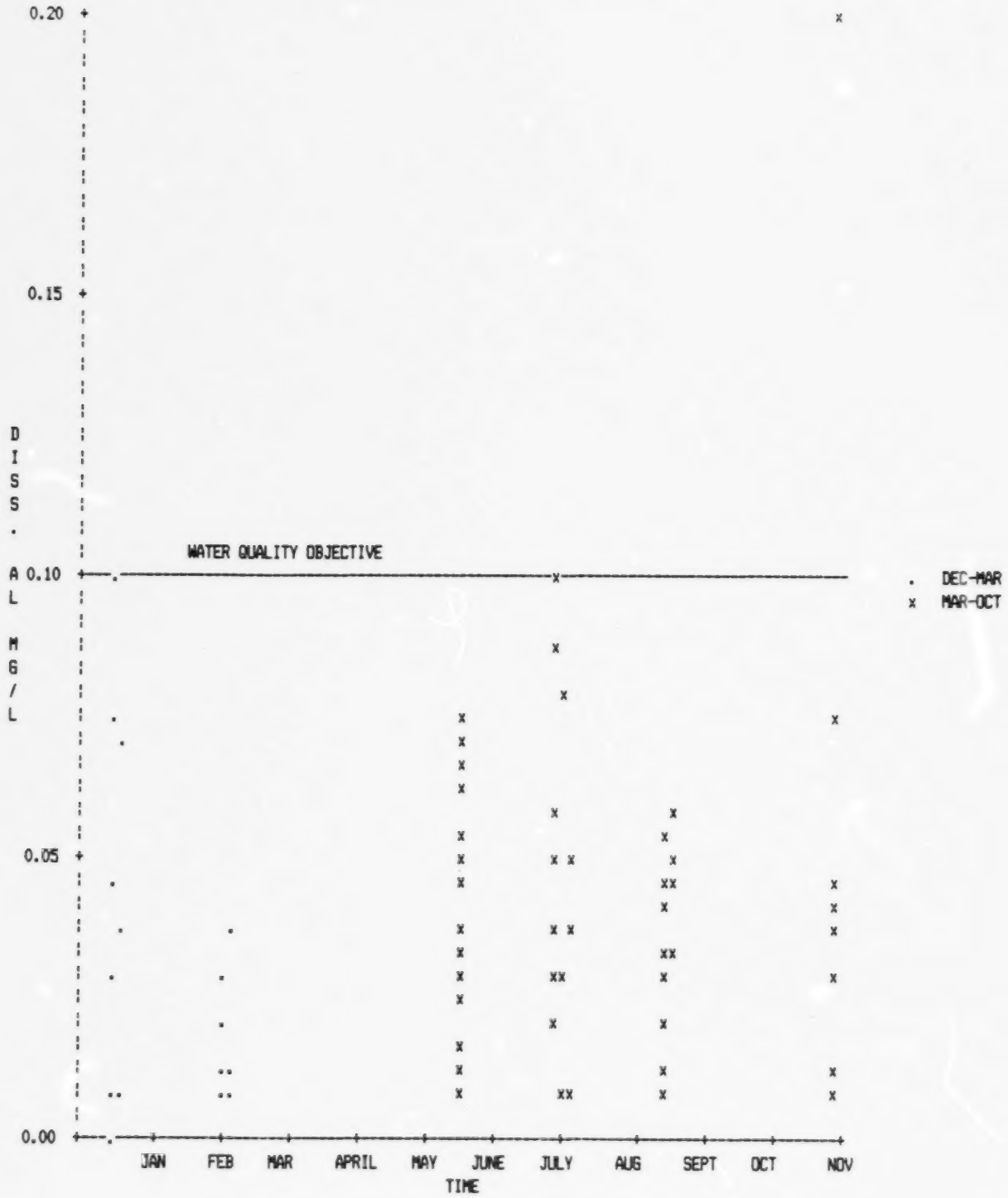


FIGURE 20

TOTAL PHOSPHORUS MG/L

| STATION | MAY | JUNE | AUG | OCT |
|---|---|---|---|---|
| SJR AT ST FRANCIS | 0.005 | 0.008 | 0.008 | 0.010 |
| ST FRANCIS RIVER | 0.011 | 0.004 | 0.010 | 0.006 |
| LITTLE RIVER | 0.012 | 0.007 | 0.014 | 0.004 |
| SJR AT CLAIR | 0.005 | 0.007 | 0.011 | 0.014 |
| SJR AT CARON BK | 0.008 | 0.007 | 0.014 | 0.006 |
| BAKER BROOK | 0.036 | 0.014 | 0.048 | |
| SJR AT EDMUNDSTON | 0.009 | 0.010 | 0.008 | |
| MADAWASKA RIVER | 0.009 | 0.022 | 0.014 | 0.160 |
| IROQUOIS RIVER | 0.011 | 0.015 | 0.009 | 0.029 |
| SJR AT ST BASILE | 0.010 | 0.023 | 0.023 | 0.039 |
| GREEN RIVER | 0.011 | 0.012 | 0.004 | 0.004 |
| QUISIBIS RIVER | 0.012 | 0.031 | 0.015 | 0.004 |
| SIEGAS RIVER | 0.008 | 0.019 | 0.026 | 0.005 |
| GRAND RIVER | 0.017 | 0.061 | 0.011 | 0.006 |
| SJR AT ST LEONARD | 0.017 | 0.014 | 0.011 | 0.028 |
| SJR AT GRAND FALLS | 0.016 | 0.013 | | 0.016 |

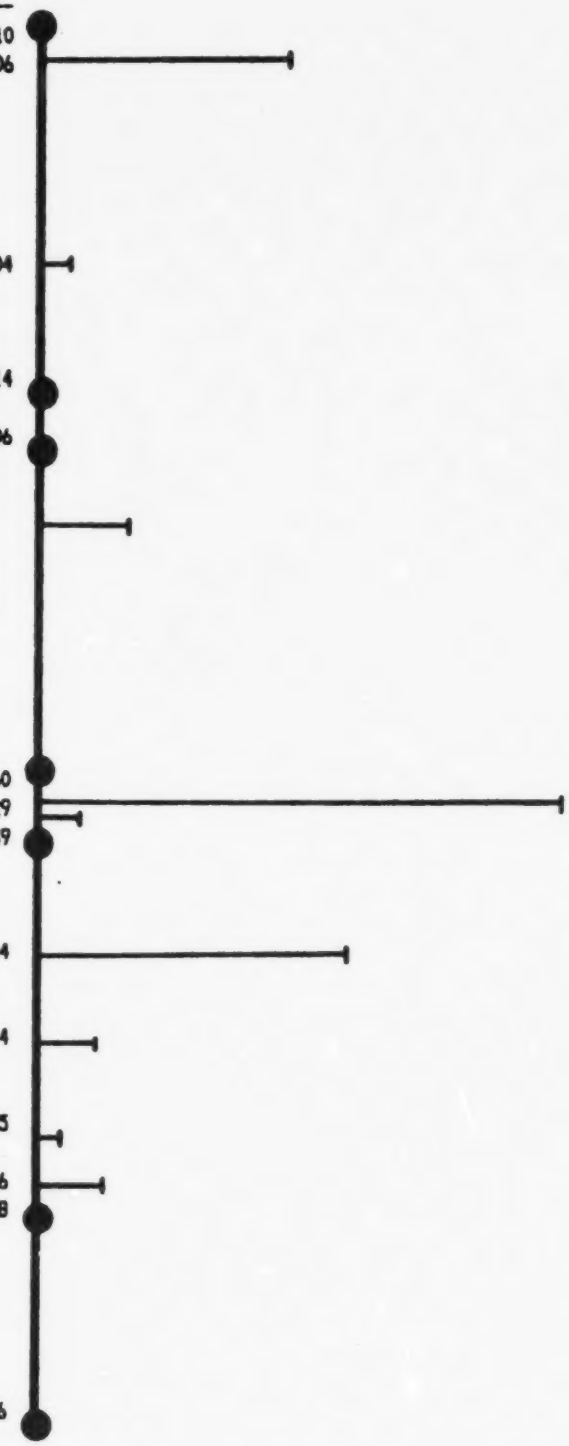


FIGURE 21

TOTAL DISSOLVED PHOSPHORUS MG/L

| STATION | MAY | JUNE | AUG | OCT |
|---|---|---|---|---|
| SJR AT ST FRANCIS | 0.001 | 0.005 | 0.005 | 0.001 |
| ST FRANCIS RIVER | 0.003 | | 0.005 | 0.001 |
| LITTLE RIVER | 0.001 | 0.002 | 0.008 | 0.001 |
| SJR AT CLAIR | 0.001 | 0.003 | 0.006 | 0.004 |
| SJR AT CARON BK | 0.002 | | 0.007 | 0.002 |
| BAKER BROOK | 0.003 | 0.003 | 0.017 | |
| SJR AT EDMUNDSTON | 0.003 | 0.007 | 0.008 | |
| MADAWASKA RIVER | 0.001 | 0.017 | 0.006 | 0.150 |
| IROQUOIS RIVER | 0.001 | 0.008 | 0.004 | 0.001 |
| SJR AT ST BASILE | 0.003 | 0.009 | 0.008 | 0.019 |
| GREEN RIVER | 0.001 | 0.004 | 0.002 | 0.001 |
| QUISIBIS RIVER | 0.001 | 0.008 | 0.007 | 0.001 |
| SIEGAS RIVER | 0.001 | 0.010 | 0.006 | 0.001 |
| GRAND RIVER | 0.003 | 0.009 | 0.004 | 0.001 |
| SJR AT ST LEONARD | 0.003 | 0.007 | 0.005 | 0.004 |
| SJR AT GRAND FALLS | 0.003 | 0.011 | | 0.006 |

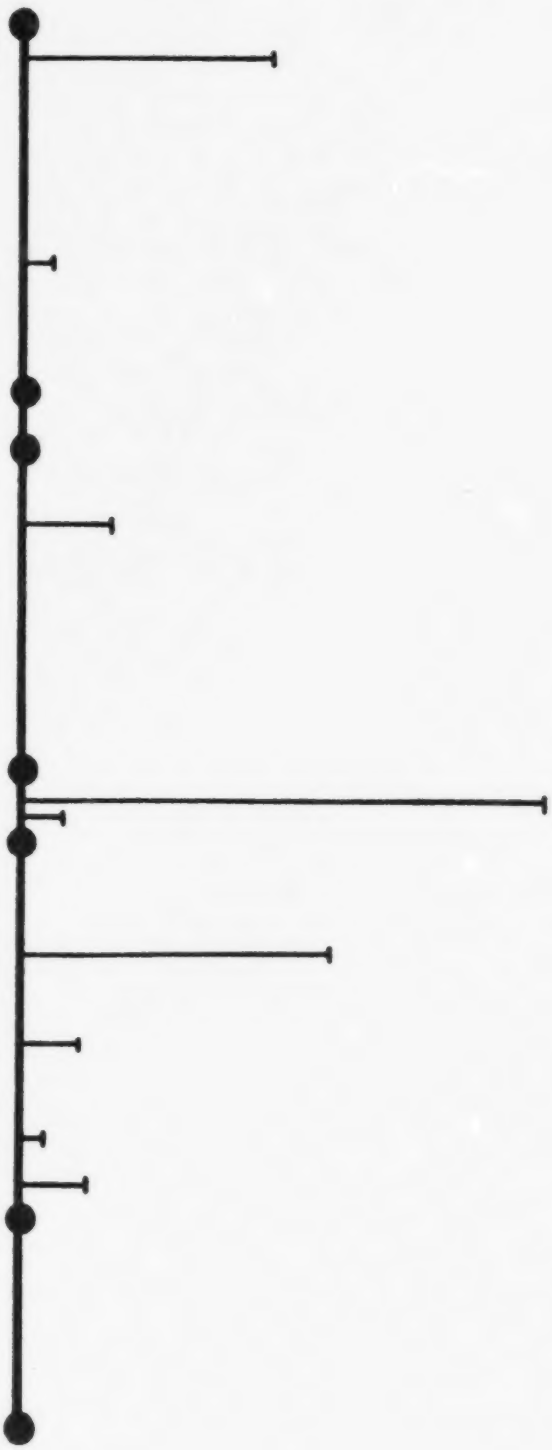


FIGURE 22: SEASONAL VARIATION OF TOTAL PHOSPHORUS FOR THE SAINT JOHN RIVER MONITORING STATIONS

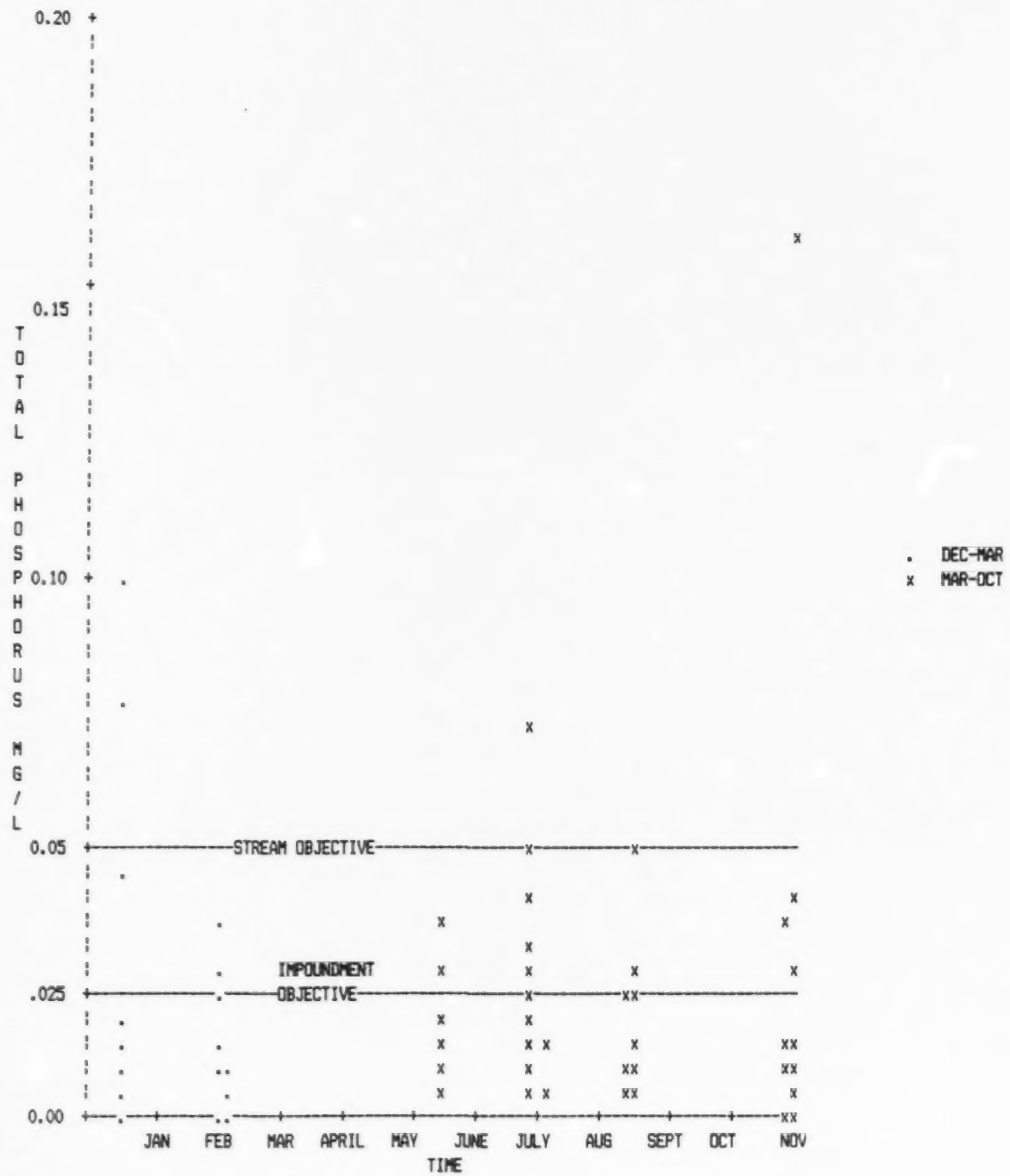


FIGURE 23: SEASONAL VARIATION OF N:P RATIO FOR THE SAINT JOHN RIVER MONITORING STATIONS

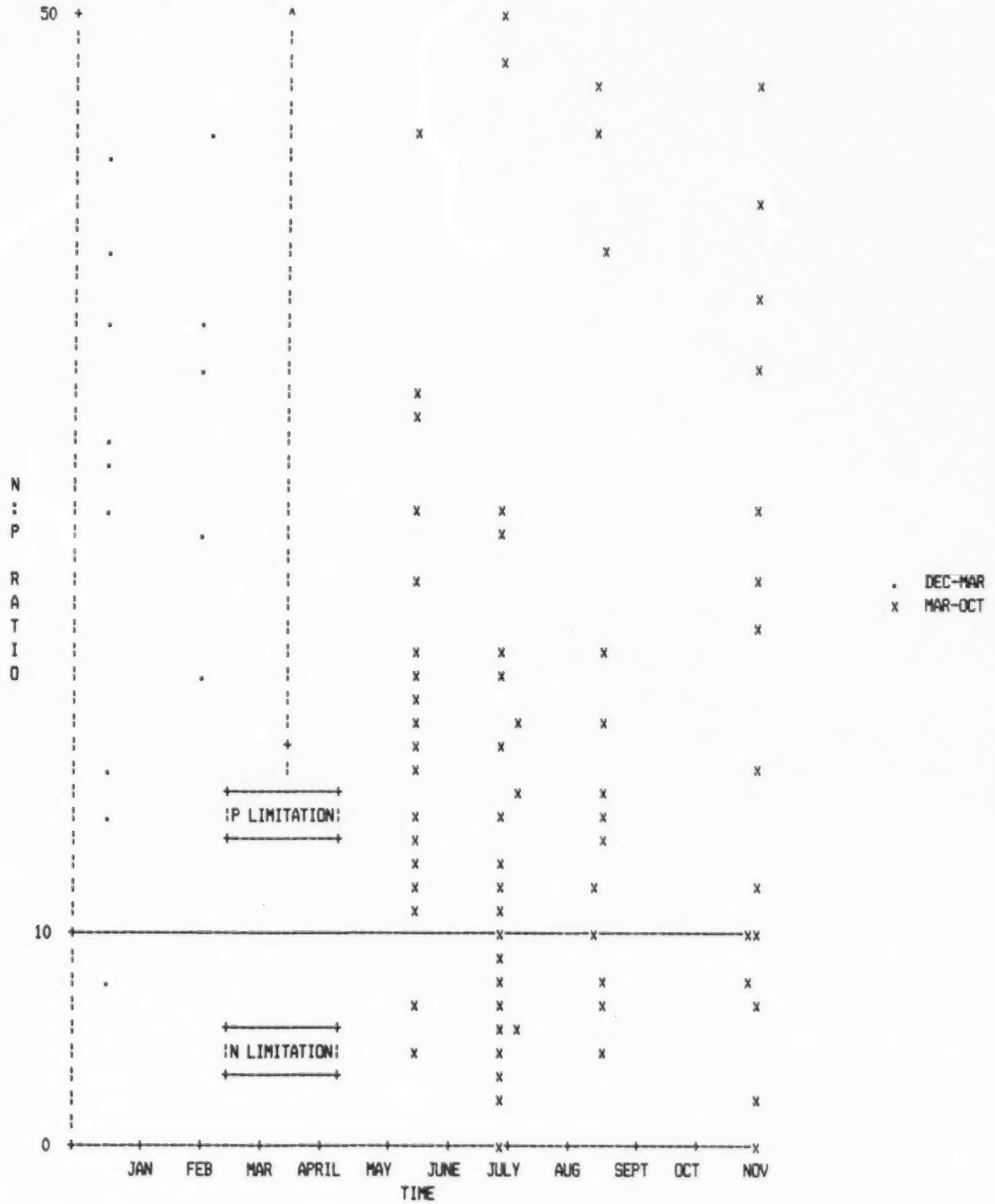
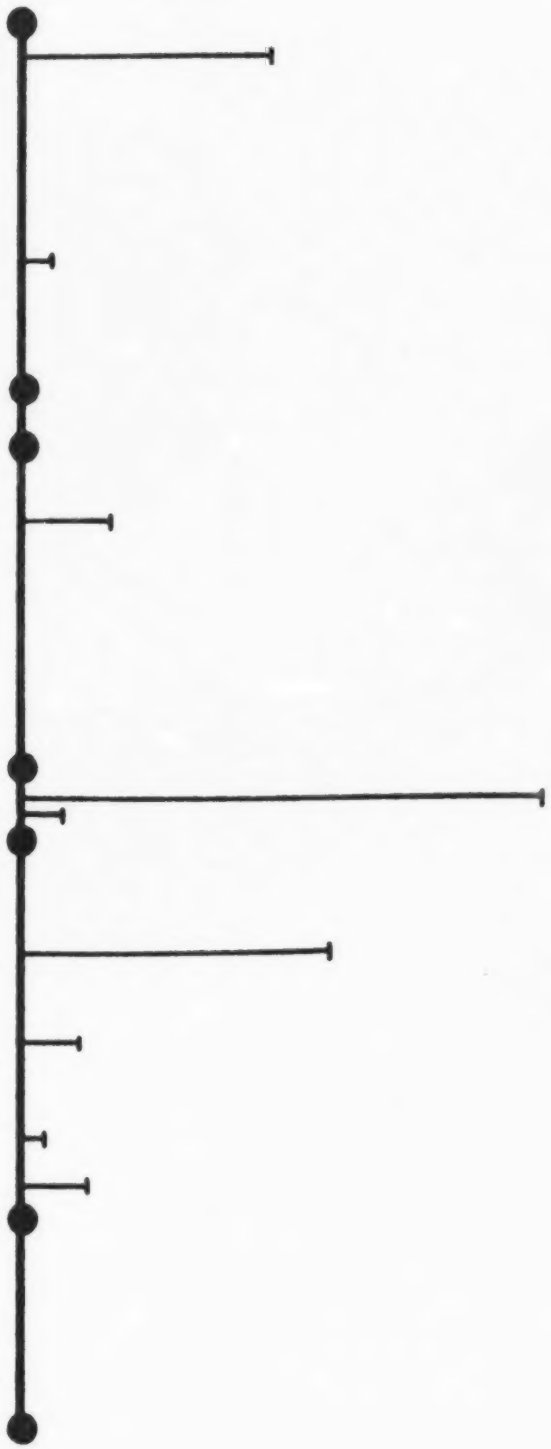


FIGURE 24

TOTAL NITROGEN MG/L

| STATION | MAY | JUNE | AUG | OCT |
|---|---|---|---|---|
| SJR AT ST FRANCIS | 0.17 | 0.12 | 0.15 | 0.23 |
| ST FRANCIS RIVER | 0.23 | 0.11 | 0.16 | 0.25 |
| LITTLE RIVER | 0.08 | 0.15 | 0.19 | 0.10 |
| SJR AT CLAIR | 0.14 | 0.11 | 0.18 | 0.17 |
| SJR AT CARON BK | 0.15 | 0.13 | 0.21 | 0.17 |
| BAKER BROOK | 0.17 | 0.08 | 0.34 | |
| SJR AT EDMUNDSTON | 0.15 | 0.13 | 0.18 | |
| MADAWASKA RIVER | 0.21 | 0.10 | 0.10 | 0.10 |
| IROQUOIS RIVER | 0.20 | 0.18 | 0.14 | 0.29 |
| SJR AT ST BASILE | 0.20 | 0.18 | 0.10 | 0.10 |
| GREEN RIVER | 0.22 | 0.17 | 0.16 | 0.14 |
| QUISIBIS RIVER | 0.15 | 0.17 | 0.21 | 0.19 |
| SIEGAS RIVER | 0.12 | 0.13 | 0.16 | 0.19 |
| GRAND RIVER | 0.11 | 0.15 | 0.11 | 0.10 |
| SJR AT ST LEONARD | 0.18 | 0.11 | 0.13 | 0.18 |
| SJR AT GRAND FALLS | 0.18 | 0.12 | | 0.15 |



# APPENDIX I

## SAINT JOHN RIVER WATER QUALITY

## MONITORING DATA 1983-1984

APPENDIX 1a. WATER QUALITY DATA FOR THE TWENTY SAINT JOHN RIVER MONITORING STATIONS SAMPLED FROM MAY TO OCTOBER 1984

| SITE | STATION NUMBER | SAMPLE NUMBER | SAMPLE DATE | SAMPLE TIME | WATER TEMPERATURE DEG. C. | DISS. OXYGEN MG/L | FIELD PH | FIELD SP. COND. US/CM | LAB PH | LAB SP. COND. US/CM |
|---|---|---|---|---|---|---|---|---|---|---|
| STJ @ ST FRANCIS | 00NB01AD0031 | 400551 | 17-MAY-84 | 930 | 7.0 | 12.6 | 7.0 | 24 | 6.7 | 41 |
| ST FRANCIS RIVER | 00NB01AD0013 | 400545 | 16-MAY-84 | 1210 | | | | | 6.7 | 61 |
| ST FRANCIS RIVER | 00NB01AD0013 | 400544 | 16-MAY-84 | 1205 | | | | | 6.7 | 61 |
| ST FRANCIS RIVER | 00NB01AD0013 | 400543 | 16-MAY-84 | 1201 | 5.0 | 14.2 | 7.0 | 63 | 6.8 | 62 |
| LITTLE RIVER | 00NB01AD0009 | 400546 | 16-MAY-84 | 1300 | 5.8 | 13.8 | | 38 | 6.7 | 39 |
| STJ @ CLAIR | 00NB01AD0001 | 400552 | 17-MAY-84 | 1045 | 6.5 | 13.8 | 7.0 | 42 | 6.7 | 39 |
| STJ @ CARON BK | 00NB01AD0017 | 400547 | 16-MAY-84 | 1415 | 7.0 | 13.6 | 7.0 | 48 | 6.7 | 39 |
| STJ @ CARON BK | 00NB01AD0017 | 400548 | 16-MAY-84 | 1420 | | | | | 6.7 | 39 |
| STJ @ CARON BK | 00NB01AD0017 | 400549 | 16-MAY-84 | 1425 | | | | | 6.7 | 39 |
| BAKER BROOK | 00NB01AD0019 | 400550 | 16-MAY-84 | 1500 | 6.5 | 13.0 | | 80 | 6.9 | 76 |
| STJ @ EDMUNDSTON | 00NB01AD0008 | 400553 | 17-MAY-84 | 1201 | 6.6 | 13.2 | 7.1 | 46 | 6.7 | 44 |
| MADAWASKA RIVER | 00NB01AD0016 | 400555 | 17-MAY-84 | 1220 | | | | | 7.2 | 122 |
| MADAWASKA RIVER | 00NB01AD0016 | 400556 | 17-MAY-84 | 1230 | | | | | 7.2 | 122 |
| MADAWASKA RIVER | 00NB01AD0016 | 400554 | 17-MAY-84 | 1210 | 4.4 | 14.6 | | 126 | 7.1 | 122 |
| IROQUOIS RIVER | 00NB01AF0019 | 400542 | 16-MAY-84 | 1030 | 6.0 | 13.6 | | 56 | 6.7 | 56 |
| STJ @ ST BASILE | 00NB01AF0038 | 400541 | 16-MAY-84 | 1010 | 5.5 | 13.7 | 7.4 | 86 | 6.8 | 91 |
| GREEN RIVER | 00NB01AF0021 | 400540 | 16-MAY-84 | 945 | 5.5 | | | 64 | 6.8 | 66 |
| QUISIBIS RIVER | 00NB01AF0015 | 400539 | 16-MAY-84 | 900 | 5.3 | 13.0 | | 42 | 6.7 | 43 |
| SIEGAS RIVER | 00NB01AF0014 | 400538 | 16-MAY-84 | 830 | 5.5 | 12.8 | 7.3 | 66 | 6.8 | 69 |
| GRAND RIVER | 00NB01AF0023 | 400537 | 15-MAY-84 | 1500 | 5.5 | 12.8 | 7.3 | 71 | 6.9 | 72 |
| STJ @ ST LEONARD | 00NB01AF0002 | 400536 | 15-MAY-84 | 1430 | 6.3 | 13.6 | 7.2 | 59 | 6.8 | 60 |
| STJ @ GRAND FALLS | 01NB01AF0005 | 400535 | 15-MAY-84 | 1330 | 6.3 | 12.8 | 7.1 | 59 | 6.7 | 59 |
| LIMESTONE STR | 00NB01AG0003 | 400534 | 15-MAY-84 | 1146 | 7.6 | 13.3 | | 200 | 7.4 | 199 |
| ARDOSTOOK RIVER | 01NB01AG0001 | 400533 | 15-MAY-84 | 1115 | 8.0 | 11.8 | 7.1 | 66 | 6.8 | 66 |
| PRESQUILE RIVER | 00NB01AJ0012 | 400532 | 15-MAY-84 | 1000 | 6.8 | | | 198 | 7.6 | 201 |
| MEDUXNEKEAG RIVER | 00NB01AJ0029 | 400531 | 15-MAY-84 | 830 | 7.3 | 12.6 | 7.7 | 102 | 7.0 | 101 |
| STJ @ ST FRANCIS | 00NB01AD0031 | 401285 | 28-JUN-84 | 1300 | 15.5 | 10.2 | 7.1 | 42 | 7.1 | 44 |
| ST FRANCIS RIVER | 00NB01AD0013 | 401283 | 28-JUN-84 | 1000 | 14.4 | 9.9 | 7.4 | 76 | 7.2 | 67 |
| LITTLE RIVER | 00NB01AD0009 | 401284 | 28-JUN-84 | 1110 | 10.3 | | 7.2 | 67 | 7.1 | 60 |
| STJ @ CLAIR | 00NB01AD0001 | 401286 | 04-JUL-84 | 1245 | 22.0 | 8.6 | | 50 | 7.1 | 49 |
| STJ @ CARON BK | 00NB01AD0017 | 401287 | 04-JUL-84 | 1350 | 22.5 | 8.8 | | 38 | 7.1 | 50 |
| BAKER BROOK | 00NB01AD0019 | 401288 | 04-JUL-84 | 1415 | 20.0 | 8.6 | | 97 | 7.4 | 92 |
| STJ @ EDMUNDSTON | 00NB01AD0008 | 401282 | 27-JUN-84 | 1600 | 15.5 | 10.0 | 7.5 | 62 | 7.2 | 58 |
| MADAWASKA RIVER | 00NB01AD0016 | 401281 | 27-JUN-84 | 1530 | 11.3 | 10.9 | 6.9 | 169 | 7.0 | 162 |
| IROQUOIS RIVER | 00NB01AF0019 | 401280 | 27-JUN-84 | 1445 | 11.5 | 10.4 | 7.5 | 74 | 7.1 | 70 |
| STJ @ ST BASILE | 00NB01AF0038 | 401279 | 27-JUN-84 | 1415 | 13.0 | 10.0 | 7.2 | 66 | 7.1 | 96 |
| GREEN RIVER | 00NB01AF0021 | 401274 | 27-JUN-84 | 1145 | 12.2 | 10.6 | 7.8 | 84 | 7.5 | 81 |
| GREEN RIVER | 00NB01AF0021 | 401275 | 27-JUN-84 | 1150 | 12.2 | 10.6 | 7.8 | 84 | 7.5 | 81 |
| GREEN RIVER | 00NB01AF0021 | 401276 | 27-JUN-84 | 1155 | 12.2 | 10.6 | 7.8 | 84 | 7.5 | 81 |
| QUISIBIS RIVER | 00NB01AF0015 | 401278 | 27-JUN-84 | 1340 | 10.8 | 10.4 | 7.3 | 56 | 7.0 | 55 |
| SIEGAS RIVER | 00NB01AF0014 | 401277 | 27-JUN-84 | 1310 | 11.5 | 10.2 | 7.4 | 72 | 7.4 | 71 |
| GRAND RIVER | 00NB01AF0023 | 401271 | 27-JUN-84 | 1045 | 10.5 | 10.4 | 7.4 | 87 | 7.2 | 67 |
| GRAND RIVER | 00NB01AF0023 | 401272 | 27-JUN-84 | 1050 | 10.5 | 10.4 | 7.4 | 87 | 7.2 | 67 |
| GRAND RIVER | 00NB01AF0023 | 401273 | 27-JUN-84 | 1055 | 10.5 | 10.4 | 7.4 | 87 | 7.2 | 68 |
| STJ @ ST LEONARD | 00NB01AF0002 | 401268 | 26-JUN-84 | 1615 | 15.0 | 9.2 | 7.4 | 84 | 7.3 | 81 |
| STJ @ ST LEONARD | 00NB01AF0002 | 401269 | 26-JUN-84 | 1620 | 15.0 | 9.2 | 7.4 | 84 | 7.0 | 81 |
| STJ @ ST LEONARD | 00NB01AF0002 | 401270 | 26-JUN-84 | 1625 | 15.0 | 9.2 | 7.4 | 84 | 7.2 | 81 |
| STJ @ GRAND FALLS | 01NB01AF0005 | 401267 | 26-JUN-84 | 1430 | 15.8 | 9.1 | 7.3 | 80 | 7.1 | 76 |
| LIMESTONE STR | 00NB01AG0003 | 401266 | 26-JUN-84 | 1340 | 12.6 | 11.3 | 8.1 | 220 | 7.9 | 261 |

* OBSERVATIONS WHICH ARE BELOW THE DETECTION LIMIT ARE GIVEN THE DETECTION VALUE

APPENDIX 1a. WATER QUALITY DATA FOR THE TWENTY SAINT JOHN RIVER MONITORING STATIONS SAMPLED FROM MAY TO OCTOBER 1984

| SITE | STATION NUMBER | SAMPLE NUMBER | SAMPLE DATE | SAMPLE TIME | WATER TEMPERATURE DEG. C. | DISS. OXYGEN MG/L | FIELD PH | FIELD SP. COND. US/CM | LAB PH | LAB SP. COND. US/CM |
|---|---|---|---|---|---|---|---|---|---|---|
| AROOSTOOK RIVER | 01NB01AG0001 | 401265 | 26-JUN-84 | 1300 | 15.5 | 9.5 | 7.8 | 113 | 7.5 | 108 |
| PRESQUILE RIVER | 00NB01AJ0012 | 401264 | 26-JUN-84 | 1100 | 12.2 | 9.5 | 8.1 | 280 | 8.1 | 287 |
| MEDUXNEKEAG RIVER | 00NB01AJ0029 | 401263 | 26-JUN-84 | 930 | 13.5 | 10.4 | 7.9 | 160 | 7.7 | 153 |
| STJ @ ST FRANCIS | 00NB01AD0031 | 401886 | 16-AUG-84 | 1235 | 22.0 | | 7.6 | 62 | 7.0 | 56 |
| ST FRANCIS RIVER | 00NB01AD0013 | 401879 | 15-AUG-84 | 930 | 20.5 | | 7.5 | 76 | 7.5 | 77 |
| LITTLE RIVER | 00NB01AD0009 | 401891 | 16-AUG-84 | 1201 | | | | | 7.7 | 67 |
| STJ @ CLAIR | 00NB01AD0001 | 401883 | 15-AUG-84 | 1145 | 21.1 | | 7.3 | 66 | 7.2 | 56 |
| STJ @ CARON BK | 00NB01AD0017 | 401887 | 16-AUG-84 | 1330 | 21.2 | | 6.8 | 54 | 7.3 | 57 |
| BAKER BROOK | 00NB01AD0019 | 401888 | 16-AUG-84 | 1415 | 18.8 | | 7.4 | 92 | 7.5 | 79 |
| STJ @ EDMUNDSTON | 00NB01AD0008 | 401885 | 15-AUG-84 | 1415 | 23.5 | | 7.7 | 58 | 7.5 | 71 |
| MADAWASKA RIVER | 00NB01AD0016 | 401884 | 15-AUG-84 | 1345 | 22.4 | | 7.7 | 125 | 7.6 | 123 |
| IROQUOIS RIVER | 00NB01AF0019 | 401882 | 15-AUG-84 | 1130 | 20.0 | | 7.8 | 96 | 7.5 | 89 |
| STJ @ ST BASILE | 00NB01AF0038 | 401881 | 15-AUG-84 | 1100 | 22.4 | | 7.5 | 140 | 7.3 | 131 |
| GREEN RIVER | 00NB01AF0021 | 401880 | 15-AUG-84 | 1010 | 20.0 | | 7.9 | 98 | 7.6 | 91 |
| QUISIBIS RIVER | 00NB01AF0015 | 401878 | 15-AUG-84 | 930 | 17.6 | | 7.4 | 84 | 7.3 | 84 |
| SIEGAS RIVER | 00NB01AF0014 | 401877 | 15-AUG-84 | 845 | 19.5 | | 7.8 | 147 | 7.7 | 144 |
| GRAND RIVER | 00NB01AF0023 | 401875 | 14-AUG-84 | 1400 | 20.5 | | 7.9 | 130 | 7.8 | 126 |
| STJ @ ST LEONARD | 00NB01AF0002 | 401870 | 14-AUG-84 | 1330 | 22.0 | | 7.5 | 80 | 7.4 | 94 |
| PRESQUILE RIVER | 00NB01AJ0012 | 401867 | 13-AUG-84 | 1730 | 23.0 | | 9.1 | 310 | 8.0 | 306 |
| MEDUXNEKEAG RIVER | 00NB01AJ0029 | 401866 | 13-AUG-84 | 1615 | 23.5 | | 8.8 | 220 | 8.3 | 214 |
| STJ @ ST FRANCIS | 00NB01AD0031 | 402954 | 30-OCT-84 | 1600 | 8.5 | 13.7 | 8.1 | 72 | 7.6 | 70 |
| ST FRANCIS RIVER | 00NB01AD0013 | 402952 | 30-OCT-84 | 1415 | 10.0 | 10.7 | 7.1 | 81 | 7.3 | 80 |
| LITTLE RIVER | 00NB01AD0009 | 402953 | 30-OCT-84 | 1515 | 5.5 | 12.8 | 7.0 | 78 | 7.8 | 80 |
| STJ @ CLAIR | 00NB01AD0001 | 402955 | 30-OCT-84 | 1650 | 7.0 | 9.6 | 7.2 | 70 | 7.4 | 69 |
| STJ @ CARON BK | 00NB01AD0017 | 402956 | 30-OCT-84 | 1700 | 7.5 | 11.2 | 7.3 | 66 | 7.5 | 69 |
| MADAWASKA RIVER | 00NB01AD0016 | 402950 | 30-OCT-84 | 1210 | 10.5 | 11.4 | 7.4 | 400 | 6.7 | 378 |
| IROQUOIS RIVER | 00NB01AF0019 | 402949 | 30-OCT-84 | 1150 | 5.0 | 12.4 | 7.2 | 90 | 7.4 | 90 |
| STJ @ ST BASILE | 00NB01AF0038 | 402948 | 30-OCT-84 | 1120 | 7.5 | 10.5 | 7.3 | 168 | 7.6 | 169 |
| GREEN RIVER | 00NB01AF0021 | 402947 | 30-OCT-84 | 1045 | 4.0 | 13.4 | 7.1 | 98 | 7.9 | 103 |
| QUISIBIS RIVER | 00NB01AF0015 | 402946 | 30-OCT-84 | 1010 | 4.0 | 12.2 | 7.0 | 86 | 7.7 | 86 |
| SIEGAS RIVER | 00NB01AF0014 | 402945 | 30-OCT-84 | 940 | 2.5 | 12.9 | 7.4 | 140 | 7.9 | 143 |
| GRAND RIVER | 00NB01AF0023 | 402944 | 30-OCT-84 | 915 | 4.0 | 12.2 | 7.4 | 170 | 7.9 | 172 |
| STJ @ ST LEONARD | 00NB01AF0002 | 402943 | 30-OCT-84 | 820 | 7.0 | 10.4 | 6.7 | 108 | 7.8 | 113 |
| STJ @ GRAND FALLS | 01NB01AF0005 | 402942 | 29-OCT-84 | 1520 | | | 6.7 | 120 | 7.5 | 119 |
| LIMESTONE STR | 00NB01AG0003 | 402941 | 29-OCT-84 | 1430 | | | 8.7 | 220 | 8.7 | 304 |
| AROOSTOOK RIVER | 01NB01AG0001 | 402940 | 29-OCT-84 | 1410 | | | 7.5 | 132 | 7.6 | 131 |

* OBSERVATIONS WHICH ARE BELOW THE DETECTION LIMIT ARE GIVEN THE DETECTION VALUE

APPENDIX 1a. WATER QUALITY DATA FOR THE TWENTY SAINT JOHN RIVER MONITORING STATIONS SAMPLED FROM MAY TO OCTOBER 1984

| SITE | WATER COLOUR H. U. | TURBIDITY JTU | TOTAL ALKALINITY MG/L | GRAN ALKALINITY MG/L | CALCIUM MG/L | MAGNESIUM MG/L | POTASSIUM MG/L | SODIUM MG/L | SULPHATE MG/L | CHLORIDE MG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| STJ @ ST FRANCIS | 45 | 0.6 | 12.1 | | 5.9 | 0.87 | 0.40 | 0.9 | | 0.7 |
| ST FRANCIS RIVER | 45 | 7.9 | 19.4 | | 9.4 | 0.94 | 0.40 | 1.3 | | 1.5 |
| ST FRANCIS RIVER | 30 | 3.0 | 19.4 | | 9.5 | 0.89 | 0.40 | 1.2 | 4.6 | 1.5 |
| ST FRANCIS RIVER | 30 | 1.2 | 19.6 | | 9.5 | 0.84 | 0.40 | 1.2 | 4.8 | 1.5 |
| LITTLE RIVER | 20 | 8.8 | 12.6 | | 5.5 | 0.77 | 0.20 | 0.9 | 4.1 | 0.5 |
| STJ @ CLAIR | 50 | 1.6 | 11.4 | | 5.9 | 0.75 | 0.30 | 0.8 | | 0.7 |
| STJ @ CARON BK | 55 | 1.6 | 11.1 | | 5.8 | 0.74 | 0.30 | 0.9 | | 0.8 |
| STJ @ CARON BK | 50 | 0.7 | 11.3 | | 5.9 | 0.74 | 0.30 | 0.9 | | 0.8 |
| STJ @ CARON BK | 45 | 0.7 | 11.1 | | 5.8 | 0.74 | 0.30 | 0.9 | | 0.8 |
| BAKER BROOK | 15 | 2.6 | 29.3 | | 11.0 | 1.50 | 0.30 | 1.6 | 4.1 | 1.6 |
| STJ @ EDMUNDSTON | 40 | 1.4 | 13.1 | | 6.4 | 0.86 | 0.30 | 1.0 | | 1.0 |
| MADAWASKA RIVER | 20 | 1.7 | 50.0 | | 19.0 | 2.30 | 0.50 | 2.1 | | 2.1 |
| MADAWASKA RIVER | 10 | 0.6 | 50.3 | | 19.0 | 2.30 | 0.50 | 2.1 | | 2.2 |
| MADAWASKA RIVER | 15 | 1.5 | 49.0 | | 19.0 | 2.30 | 0.40 | 2.1 | 6.0 | 2.1 |
| IROQUOIS RIVER | 25 | 2.5 | 18.1 | | 7.5 | 1.30 | 0.30 | 1.3 | 5.1 | 0.9 |
| STJ @ ST BASILE | 30 | 1.7 | 32.2 | | 14.0 | 1.80 | 0.40 | 2.1 | 6.0 | 2.4 |
| GREEN RIVER | 10 | 4.0 | 25.5 | | 9.7 | 1.50 | 0.20 | 1.0 | 2.7 | 0.6 |
| QUISIBIS RIVER | 20 | 3.2 | 14.5 | | 5.6 | 1.10 | 0.20 | 1.2 | 4.0 | 0.9 |
| SIEGAS RIVER | 30 | 1.0 | 26.5 | | 11.0 | 1.40 | 0.20 | 1.1 | 4.2 | 1.0 |
| GRAND RIVER | 45 | 3.1 | 26.9 | | 12.0 | 0.91 | 0.30 | 1.4 | | 1.9 |
| STJ @ ST LEONARD | 35 | 3.6 | 20.0 | | 8.7 | 1.30 | 0.30 | 1.1 | | 1.2 |
| STJ @ GRAND FALLS | 35 | 2.8 | 20.2 | | 8.9 | 1.20 | 0.30 | 1.2 | | 1.3 |
| LIMESTONE STR | 20 | 0.6 | 69.0 | | 32.0 | 3.20 | 0.70 | 2.0 | 14.2 | 5.4 |
| ARDOSTOOK RIVER | 50 | 1.1 | 21.3 | | 9.9 | 1.40 | 0.40 | 1.1 | 5.8 | 1.6 |
| PRESQUILE RIVER | 15 | 0.9 | 79.2 | | 35.0 | 2.70 | 0.80 | 2.1 | 11.5 | 4.7 |
| MEDUXNEKEAG RIVER | 35 | 0.5 | 38.3 | | 16.0 | 1.60 | 0.60 | 1.6 | | 2.3 |
| STJ @ ST FRANCIS | 75 | 0.4 | 14.7 | | 7.0 | 1.00 | 0.30 | 0.9 | 4.5 | 0.5 |
| ST FRANCIS RIVER | 30 | 0.3 | 23.9 | | 11.0 | 0.97 | 0.30 | 1.4 | 4.8 | 1.3 |
| LITTLE RIVER | 20 | 0.2 | 23.3 | | 9.6 | 1.10 | 0.25 | 1.4 | 4.0 | 0.6 |
| STJ @ CLAIR | 45 | 0.3 | 16.6 | | 7.8 | 1.10 | 0.30 | 1.0 | 4.3 | 0.6 |
| STJ @ CARON BK | 50 | 0.3 | 17.0 | | 7.8 | 1.00 | 0.35 | 1.2 | 4.5 | 0.8 |
| BAKER BROOK | 5 | 0.4 | 37.1 | | 14.0 | 1.70 | 0.35 | 2.1 | 4.2 | 1.8 |
| STJ @ EDMUNDSTON | 40 | 0.7 | 19.9 | | 8.6 | 1.20 | 0.30 | 1.3 | 4.5 | 1.1 |
| MADAWASKA RIVER | 70 | 2.5 | 35.7 | | 18.0 | 3.50 | 0.85 | 8.1 | 20.6 | 9.6 |
| IROQUOIS RIVER | 40 | 1.7 | 27.1 | | 11.0 | 1.60 | 0.30 | 1.9 | 4.2 | 1.0 |
| STJ @ ST BASILE | 50 | 2.8 | 29.5 | | 13.0 | 2.00 | 0.50 | 3.2 | 8.2 | 3.7 |
| GREEN RIVER | 5 | 0.6 | 33.4 | | 13.0 | 1.80 | 0.30 | 1.3 | 4.0 | 0.6 |
| GREEN RIVER | 5 | 0.4 | 33.7 | | 12.0 | 1.80 | 0.20 | 1.1 | 4.2 | 0.6 |
| GREEN RIVER | 5 | 0.6 | 33.7 | | 7.4 | 1.80 | 0.25 | 1.3 | 4.2 | 0.6 |
| QUISIBIS RIVER | 45 | 2.7 | 20.6 | | 8.0 | 1.40 | 0.25 | 1.2 | 3.7 | 0.7 |
| SIEGAS RIVER | 75 | 1.6 | 29.5 | | 12.0 | 1.40 | 0.20 | 1.0 | 4.2 | 0.5 |
| GRAND RIVER | 90 | 8.4 | 26.0 | | 12.0 | 1.00 | 0.30 | 1.1 | 4.2 | 1.3 |
| GRAND RIVER | | 27.0 | 26.0 | | 12.0 | 0.94 | 0.30 | 1.1 | 4.0 | 1.1 |
| GRAND RIVER | | 28.0 | 26.1 | | 12.0 | 0.94 | 0.30 | 1.0 | 3.9 | 1.1 |
| STJ @ ST LEONARD | 35 | 0.7 | 29.5 | | 7.0 | 1.50 | 0.40 | 2.0 | 6.2 | 2.1 |
| STJ @ ST LEONARD | 40 | 0.7 | 26.6 | | 12.0 | 1.60 | 0.35 | 1.7 | 7.2 | 2.1 |
| STJ @ ST LEONARD | 30 | 0.6 | 27.7 | | 12.0 | 1.60 | 0.40 | 2.0 | 6.2 | 2.1 |
| STJ @ GRAND FALLS | 40 | 0.5 | 25.7 | | 6.2 | 1.50 | 0.35 | 1.7 | 6.8 | 2.2 |
| LIMESTONE STR | 20 | 2.7 | 94.3 | | 45.0 | 4.20 | 0.65 | 2.5 | 18.2 | 7.3 |

* OBSERVATIONS WHICH ARE BELOW THE DETECTION LIMIT ARE GIVEN THE DETECTION VALUE

APPENDIX Ia. WATER QUALITY DATA FOR THE TWENTY SAINT JOHN RIVER MONITORING STATIONS SAMPLED FROM MAY TO OCTOBER 1984

| SITE | WATER COLOUR H. U. | TURBIDITY JTU | TOTAL ALKALINITY MG/L | GRAN ALKALINITY MG/L | CALCIUM MG/L | MAGNESIUM MG/L | POTASSIUM MG/L | SODIUM MG/L | SULPHATE MG/L | CHLORIDE MG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| ARDOSTOOK RIVER | 45 | 1.2 | 37.0 | | 17.0 | 2.20 | 0.50 | 1.9 | 7.7 | 2.8 |
| PRESQUILE RIVER | 5 | 1.3 | 118.0 | | 55.0 | 3.80 | 0.90 | 3.0 | 15.1 | 6.5 |
| MEDUXNEKEAG RIVER | 25 | 0.5 | 64.5 | | 26.0 | 2.20 | 0.60 | 2.3 | 6.7 | 3.4 |
| STJ @ ST FRANCIS | 50 | 0.5 | 19.7 | | 9.0 | 1.20 | 0.30 | 1.0 | 4.5 | 0.5 |
| ST FRANCIS RIVER | 35 | 0.6 | 29.2 | | 12.0 | 2.10 | 0.30 | 1.5 | 4.2 | 0.9 |
| LITTLE RIVER | 65 | 2.1 | 25.6 | | 11.0 | 1.30 | 0.30 | 1.4 | 4.1 | 0.5 |
| STJ @ CLAIR | 70 | 2.0 | 19.4 | | 9.3 | 1.10 | 0.30 | 1.0 | 4.2 | 0.5 |
| STJ @ CARON BK | 70 | 1.9 | 19.6 | | 9.0 | 1.30 | 0.30 | 1.0 | 4.5 | 0.6 |
| BAKER BROOK | 80 | 8.9 | 30.5 | | 12.0 | 1.50 | 0.45 | 1.6 | 4.0 | 1.0 |
| STJ @ EDMUNDSTON | 45 | 1.6 | 24.6 | | 11.0 | 1.30 | 0.35 | 1.8 | 4.5 | 1.5 |
| MADAWASKA RIVER | 10 | 0.6 | 49.5 | | 18.0 | 2.30 | 0.45 | 2.3 | 5.2 | 1.8 |
| IROQUOIS RIVER | 10 | 1.4 | 35.7 | | 13.0 | 2.10 | 0.35 | 2.0 | 4.8 | 0.8 |
| STJ @ ST BASILE | 40 | 1.3 | 39.8 | | 18.0 | 3.00 | 0.60 | 4.1 | 12.5 | 4.3 |
| GREEN RIVER | 5 | 0.8 | 37.9 | | 13.0 | 2.10 | 0.30 | 1.6 | 4.0 | 0.5 |
| QUISIBIS RIVER | 10 | 3.2 | 33.7 | | 12.0 | 2.10 | 0.50 | 2.0 | 3.6 | 0.9 |
| SIEGAS RIVER | 50 | 25.0 | 64.0 | | 23.0 | 3.00 | 0.50 | 1.8 | 4.2 | 0.7 |
| GRAND RIVER | 50 | 2.5 | 55.2 | | 22.0 | 1.70 | 0.35 | 1.8 | 4.6 | 1.4 |
| STJ @ ST LEONARD | 30 | 1.1 | 33.0 | | 13.0 | 2.00 | 0.40 | 2.2 | 7.0 | 2.0 |
| PRESQUILE RIVER | 5 | 0.5 | 120.0 | | 50.0 | 4.80 | 1.10 | 4.0 | 15.7 | 7.2 |
| MEDUXNEKEAG RIVER | 5 | 0.4 | 90.2 | | 35.0 | 3.30 | 0.70 | 4.0 | 7.7 | 4.5 |
| STJ @ ST FRANCIS | 30 | 0.5 | 22.8 | | 10.0 | 1.40 | 0.90 | 1.7 | 6.7 | 1.4 |
| ST FRANCIS RIVER | 20 | 0.3 | 28.8 | | 13.0 | 1.10 | 0.30 | 1.4 | 5.2 | 1.1 |
| LITTLE RIVER | 5 | 0.3 | 31.8 | | 12.0 | 1.50 | 0.27 | 1.7 | 4.4 | 1.0 |
| STJ @ CLAIR | 35 | 0.6 | 23.9 | | 11.0 | 1.40 | 0.45 | 1.5 | 5.0 | 1.3 |
| STJ @ CARON BK | 35 | 0.5 | 23.8 | | 10.0 | 1.40 | 0.45 | 1.4 | 5.0 | 1.2 |
| MADAWASKA RIVER | 120 | 7.5 | 56.1 | | 38.0 | 11.00 | 1.70 | 20.0 | 68.0 | 30.0 |
| IROQUOIS RIVER | 10 | 2.1 | 33.9 | | 13.0 | 2.00 | 0.40 | 2.0 | 5.5 | 1.5 |
| STJ @ ST BASILE | 60 | 1.8 | 36.4 | | 19.0 | 4.60 | 0.80 | 6.4 | 23.7 | 8.2 |
| GREEN RIVER | 5 | 0.3 | 42.9 | | 16.0 | 2.20 | 0.27 | 1.6 | 4.4 | 0.6 |
| QUISIBIS RIVER | 5 | 1.4 | 34.0 | | 12.0 | 2.10 | 0.30 | 2.0 | 4.2 | 1.1 |
| SIEGAS RIVER | 10 | 1.4 | 61.3 | | 23.0 | 2.80 | 0.35 | 2.1 | 5.5 | 1.3 |
| GRAND RIVER | 10 | 2.7 | 72.7 | | 29.0 | 2.20 | 0.41 | 2.3 | 5.2 | 2.5 |
| STJ @ ST LEONARD | 45 | 1.5 | 32.3 | | 15.0 | 2.40 | 0.50 | 3.5 | 11.0 | 4.3 |
| STJ @ GRAND FALLS | 40 | 1.1 | 33.9 | | 16.0 | 2.40 | 0.55 | 4.0 | 11.2 | 5.0 |
| LIMESTONE STR | 5 | 0.5 | 116.8 | | 52.0 | 5.40 | 0.65 | 3.2 | 19.2 | 6.5 |
| ARDOSTOOK RIVER | 15 | 0.7 | 46.5 | | 19.0 | 2.80 | 0.62 | 2.6 | 8.3 | 3.1 |

* OBSERVATIONS WHICH ARE BELOW THE DETECTION LIMIT ARE GIVEN THE DETECTION VALUE

APPENDIX 1a. WATER QUALITY DATA FOR THE TWENTY SAINT JOHN RIVER MONITORING STATIONS SAMPLED FROM MAY TO OCTOBER 1984

| SITE | EXT. CADMIUM MG/L * | EXT. LEAD MG/L * | EXT. COPPER MG/L * | EXT. ZINC MG/L * | EXT. IRON MG/L | EXT. ALUMINIUM MG/L | EXT. MANGANESE MG/L | MERCURY MG/L * | DISS. ORG. CARBON MG/L | DISS. ALUMINIUM MG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| STJ @ ST FRANCIS | 0.001 | 0.002 | 0.002 | 0.01 | 0.12 | 0.100 | 0.04 | 0.02 | 6.8 | 0.077 |
| ST FRANCIS RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.13 | 0.095 | 0.03 | | 5.6 | 0.040 |
| ST FRANCIS RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.16 | 0.120 | 0.03 | | 5.9 | 0.035 |
| ST FRANCIS RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.15 | 0.110 | 0.03 | 0.02 | 6.0 | 0.037 |
| LITTLE RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.13 | 0.110 | 0.01 | 0.02 | 3.8 | 0.029 |
| STJ @ CLAIR | 0.001 | 0.002 | 0.002 | 0.01 | 0.12 | 0.110 | 0.01 | 0.02 | 7.4 | 0.077 |
| STJ @ CARON BK | 0.001 | 0.002 | 0.002 | 0.01 | 0.14 | 0.130 | 0.02 | 0.02 | 7.1 | 0.070 |
| STJ @ CARON BK | 0.001 | 0.002 | 0.002 | 0.01 | 0.15 | 0.150 | 0.02 | | 7.5 | 0.077 |
| STJ @ CARON BK | 0.001 | 0.002 | 0.002 | 0.01 | 0.13 | 0.120 | 0.01 | | 6.8 | 0.067 |
| BAKER BROOK | 0.001 | 0.002 | 0.002 | 0.01 | 0.37 | 0.230 | 0.03 | 0.02 | 2.9 | 0.016 |
| STJ @ EDMUNDSTON | 0.001 | 0.002 | 0.002 | 0.01 | 0.12 | 0.120 | 0.02 | 0.02 | 6.4 | 0.065 |
| MADAWASKA RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.07 | 0.040 | 0.01 | | 4.0 | 0.010 |
| MADAWASKA RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.08 | 0.040 | 0.01 | | 4.2 | 0.010 |
| MADAWASKA RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.07 | 0.040 | 0.01 | 0.02 | 4.0 | 0.010 |
| IROQUOIS RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.15 | 0.100 | 0.02 | 0.02 | 3.8 | 0.027 |
| STJ @ ST BASILE | 0.001 | 0.002 | 0.002 | 0.01 | 0.12 | 0.084 | 0.02 | 0.02 | 5.5 | 0.032 |
| GREEN RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.12 | 0.088 | 0.02 | 0.02 | 2.2 | 0.013 |
| QUISIBIS RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.15 | 0.097 | 0.01 | 0.02 | 3.2 | 0.025 |
| SIEGAS RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.10 | 0.084 | 0.01 | 0.02 | 5.2 | 0.032 |
| GRAND RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.27 | 0.200 | 0.03 | 0.02 | 5.6 | 0.050 |
| STJ @ ST LEONARD | 0.001 | 0.002 | 0.002 | 0.01 | 0.18 | 0.130 | 0.02 | 0.02 | 5.4 | 0.050 |
| STJ @ GRAND FALLS | 0.001 | 0.002 | 0.002 | 0.01 | 0.18 | 0.140 | 0.02 | 0.02 | 6.3 | 0.045 |
| LIMESTONE STR | 0.001 | 0.002 | 0.002 | 0.01 | 0.13 | 0.110 | 0.02 | 0.02 | 6.1 | 0.025 |
| ARDOSTOOK RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.11 | 0.100 | 0.02 | 0.02 | 7.0 | 0.054 |
| PRESQUILE RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.05 | 0.044 | 0.01 | 0.02 | 3.6 | 0.012 |
| MEDUXNEKEAG RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.06 | 0.065 | 0.02 | 0.02 | 5.8 | 0.045 |
| | | | | | | | | | | |
| STJ @ ST FRANCIS | 0.001 | 0.002 | 0.002 | 0.01 | 0.19 | 0.080 | 0.01 | 0.02 | 12.0 | 0.080 |
| ST FRANCIS RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.06 | 0.030 | 0.01 | 0.02 | 6.2 | 0.030 |
| LITTLE RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.10 | 0.010 | 0.02 | 0.02 | 5.1 | 0.010 |
| STJ @ CLAIR | 0.001 | 0.002 | 0.002 | 0.01 | 0.13 | 0.040 | 0.01 | 0.02 | 9.8 | 0.040 |
| STJ @ CARON BK | 0.001 | 0.002 | 0.002 | 0.01 | 0.13 | 0.050 | 0.01 | 0.02 | 9.4 | 0.050 |
| BAKER BROOK | 0.001 | 0.002 | 0.002 | 0.01 | 0.11 | 0.010 | 0.02 | 0.02 | 2.5 | 0.010 |
| STJ @ EDMUNDSTON | 0.001 | 0.002 | 0.003 | 0.01 | 0.15 | 0.040 | 0.02 | 0.02 | 7.8 | 0.040 |
| MADAWASKA RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.26 | 0.050 | 0.04 | 0.02 | 9.8 | 0.050 |
| IROQUOIS RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.24 | 0.040 | 0.02 | 0.02 | 6.2 | 0.040 |
| STJ @ ST BASILE | 0.001 | 0.002 | 0.003 | 0.01 | 0.23 | 0.040 | 0.03 | 0.02 | 7.7 | 0.040 |
| GREEN RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.07 | 0.030 | 0.01 | 0.02 | 2.1 | 0.030 |
| GREEN RIVER | 0.001 | 0.006 | 0.002 | 0.01 | 0.07 | 0.020 | 0.01 | 0.02 | 2.0 | 0.020 |
| GREEN RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.06 | 0.020 | 0.01 | 0.02 | 2.0 | 0.020 |
| QUISIBIS RIVER | 0.001 | 0.002 | 0.003 | 0.01 | 0.58 | 0.060 | 0.03 | 0.02 | 7.5 | 0.060 |
| SIEGAS RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.39 | 0.060 | 0.04 | 0.02 | 10.0 | 0.060 |
| GRAND RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.96 | 0.100 | 0.09 | 0.02 | 14.0 | 0.100 |
| GRAND RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.97 | 0.090 | 0.10 | 0.02 | 14.0 | 0.090 |
| GRAND RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.93 | 0.100 | 0.09 | 0.02 | 12.0 | 0.100 |
| STJ @ ST LEONARD | 0.001 | 0.002 | 0.002 | 0.01 | 0.14 | 0.050 | 0.02 | 0.02 | 8.7 | 0.050 |
| STJ @ ST LEONARD | 0.001 | 0.002 | 0.002 | 0.01 | 0.14 | 0.050 | 0.02 | 0.02 | 9.1 | 0.050 |
| STJ @ ST LEONARD | 0.001 | 0.002 | 0.002 | 0.01 | 0.14 | 0.050 | 0.03 | 0.02 | 8.7 | 0.050 |
| STJ @ GRAND FALLS | 0.001 | 0.002 | 0.002 | 0.01 | 0.17 | 0.060 | 0.02 | 0.02 | 10.0 | 0.060 |
| LIMESTONE STR | 0.001 | 0.002 | 0.002 | 0.01 | 0.23 | 0.030 | 0.04 | 0.02 | 5.5 | 0.030 |

* OBSERVATIONS WHICH ARE BELOW THE DETECTION LIMIT ARE GIVEN THE DETECTION VALUE

APPENDIX 1a. WATER QUALITY DATA FOR THE TWENTY SAINT JOHN RIVER MONITORING STATIONS SAMPLED FROM MAY TO OCTOBER 1984

| SITE | EXT. CADMIUM MG/L * | EXT. LEAD MG/L * | EXT. COPPER MG/L * | EXT. ZINC MG/L * | EXT. IRON MG/L | EXT. ALUMINIUM MG/L | EXT. MANGANESE MG/L | MERCURY MG/L * | DISS. ORG. CARBON MG/L | DISS. ALUMINIUM MG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| ARDOSTOOK RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.12 | 0.050 | 0.02 | 0.02 | 9.3 | 0.050 |
| PRESQUILE RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.11 | 0.020 | 0.03 | 0.02 | 3.2 | 0.020 |
| MEDUXNEKEAG RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.15 | 0.030 | 0.02 | 0.02 | 6.1 | 0.030 |
| STJ @ ST FRANCIS | 0.001 | 0.002 | 0.002 | 0.01 | 0.12 | 0.065 | 0.01 | 0.02 | 11.0 | 0.050 |
| ST FRANCIS RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.09 | 0.040 | 0.01 | 0.02 | 8.9 | 0.030 |
| LITTLE RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.19 | 0.130 | 0.02 | 0.02 | 10.0 | 0.046 |
| STJ @ CLAIR | 0.001 | 0.002 | 0.002 | 0.01 | 0.21 | 0.110 | 0.02 | 0.02 | 14.0 | 0.054 |
| STJ @ CARON BK | 0.001 | 0.002 | 0.002 | 0.01 | 0.20 | 0.100 | 0.02 | 0.02 | 12.0 | 0.058 |
| BAKER BROOK | 0.001 | 0.002 | 0.002 | 0.01 | 0.40 | 0.280 | 0.04 | 0.02 | 10.0 | 0.036 |
| STJ @ EDMUNDSTON | 0.001 | 0.002 | 0.002 | 0.01 | 0.15 | 0.077 | 0.01 | 0.02 | 9.3 | 0.030 |
| MADAWASKA RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.10 | 0.030 | 0.02 | 0.02 | 5.7 | 0.010 |
| IROQUOIS RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.14 | 0.036 | 0.01 | 0.02 | 2.8 | 0.012 |
| STJ @ ST BASILE | 0.001 | 0.002 | 0.002 | 0.01 | 0.16 | 0.065 | 0.06 | 0.02 | 9.3 | 0.043 |
| GREEN RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.06 | 0.030 | 0.01 | 0.02 | 1.4 | 0.012 |
| QUISIBIS RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.21 | 0.083 | 0.01 | 0.02 | 2.7 | 0.010 |
| SIEGAS RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.39 | 0.310 | 0.04 | 0.02 | 5.1 | 0.022 |
| GRAND RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.28 | 0.100 | 0.02 | 0.02 | 9.3 | 0.045 |
| STJ @ ST LEONARD | 0.001 | 0.002 | 0.002 | 0.01 | 0.14 | 0.051 | 0.02 | 0.02 | 7.6 | 0.033 |
| PRESQUILE RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.07 | 0.033 | 0.01 | 0.02 | 3.7 | 0.015 |
| MEDUXNEKEAG RIVER | 0.001 | 0.002 | 0.003 | 0.01 |  | 0.027 | 0.01 | 0.02 | 4.1 | 0.022 |
| STJ @ ST FRANCIS | 0.001 | 0.002 | 0.002 | 0.01 | 0.10 | 0.050 | 0.01 | 0.02 | 6.4 | 0.040 |
| ST FRANCIS RIVER | 0.001 | 0.002 | 0.003 | 0.01 | 0.05 | 0.030 | 0.01 | 0.02 | 5.9 | 0.012 |
| LITTLE RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.06 | 0.015 | 0.01 | 0.02 | 1.9 | 0.010 |
| STJ @ CLAIR | 0.001 | 0.002 | 0.002 | 0.01 | 0.14 | 0.050 | 0.01 | 0.02 | 7.4 | 0.032 |
| STJ @ CARON BK | 0.001 | 0.002 | 0.002 | 0.01 | 0.12 | 0.041 | 0.01 | 0.02 | 7.4 | 0.032 |
| MADAWASKA RIVER | 0.001 | 0.002 | 0.002 | 0.02 | 0.38 | 0.370 | 0.23 | 0.02 | 34.0 | 0.200 |
| IROQUOIS RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.22 | 0.070 | 0.02 | 0.02 | 2.7 | 0.010 |
| STJ @ ST BASILE | 0.001 | 0.002 | 0.002 | 0.01 | 0.31 | 0.140 | 0.15 | 0.02 | 15.0 | 0.077 |
| GREEN RIVER | 0.001 | 0.002 | 0.002 | 0.01 |  | 0.010 | 0.01 | 0.02 | 1.2 | 0.010 |
| QUISIBIS RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.16 | 0.035 | 0.02 | 0.02 | 1.7 | 0.010 |
| SIEGAS RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.19 | 0.044 | 0.02 | 0.02 | 3.9 | 0.010 |
| GRAND RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.17 | 0.075 | 0.03 | 0.02 | 3.1 | 0.010 |
| STJ @ ST LEONARD | 0.001 | 0.002 | 0.002 | 0.01 | 0.19 | 0.092 | 0.03 | 0.02 | 8.0 | 0.042 |
| STJ @ GRAND FALLS | 0.001 | 0.002 | 0.002 | 0.01 | 0.18 | 0.083 | 0.02 | 0.02 | 8.3 | 0.045 |
| LIMESTONE STR | 0.001 | 0.002 | 0.002 | 0.01 |  | 0.022 | 0.01 | 0.02 | 2.3 | 0.010 |
| ARDOSTOOK RIVER | 0.001 | 0.002 | 0.002 | 0.01 | 0.08 | 0.030 | 0.01 | 0.02 | 5.2 | 0.010 |

* OBSERVATIONS WHICH ARE BELOW THE DETECTION LIMIT ARE GIVEN THE DETECTION VALUE

APPENDIX 1a. WATER QUALITY DATA FOR THE TWENTY SAINT JOHN RIVER MONITORING STATIONS SAMPLED FROM MAY TO OCTOBER 1984

| SITE | TOTAL DISS. PHOSPHORUS MG/L | TOTAL SUSP. SOLIDS MG/L | HUMIC ACID MG/L | NITROGEN NO3 & NO2 MG/L | TOTAL NITROGEN MG/L | TOTAL PHOSPHORUS MG/L |
|---|---|---|---|---|---|---|
| STJ @ ST FRANCIS | 0.001 | | 14.0 | 0.09 | 0.17 | 0.005 |
| ST FRANCIS RIVER | 0.002 | | 12.0 | 0.14 | 0.23 | 0.009 |
| ST FRANCIS RIVER | 0.003 | | 12.0 | 0.13 | 0.25 | 0.010 |
| ST FRANCIS RIVER | 0.003 | | 12.0 | 0.12 | 0.20 | 0.014 |
| LITTLE RIVER | 0.001 | 10.0 | 7.0 | 0.04 | 0.08 | 0.012 |
| STJ @ CLAIR | 0.001 | | 14.0 | 0.08 | 0.14 | 0.005 |
| STJ @ CARON BK | | | 13.0 | 0.08 | 0.15 | 0.008 |
| STJ @ CARON BK | 0.003 | | 15.0 | 0.08 | 0.15 | 0.007 |
| STJ @ CARON BK | 0.002 | | 15.0 | 0.08 | 0.15 | 0.008 |
| BAKER BROOK | 0.003 | | 5.7 | 0.10 | 0.17 | 0.036 |
| STJ @ EDMUNDSTON | 0.003 | | 13.0 | 0.08 | 0.15 | 0.009 |
| MADAWASKA RIVER | 0.001 | | 8.2 | 0.19 | 0.26 | 0.008 |
| MADAWASKA RIVER | 0.001 | | 8.4 | 0.14 | 0.18 | 0.009 |
| MADAWASKA RIVER | 0.001 | | 7.5 | 0.16 | 0.20 | 0.009 |
| IROQUOIS RIVER | 0.001 | | 7.4 | 0.14 | 0.20 | 0.011 |
| STJ @ ST BASILE | 0.003 | | 11.0 | 0.13 | 0.20 | 0.010 |
| GREEN RIVER | 0.001 | 11.0 | 3.7 | 0.17 | 0.22 | 0.011 |
| QUISIBIS RIVER | 0.001 | 10.0 | 5.3 | 0.10 | 0.15 | 0.012 |
| SIEGAS RIVER | 0.001 | | 10.0 | 0.07 | 0.12 | 0.008 |
| GRAND RIVER | 0.003 | 14.0 | 12.0 | 0.05 | 0.11 | 0.017 |
| STJ @ ST LEONARD | 0.003 | 13.0 | 12.0 | 0.11 | 0.18 | 0.017 |
| STJ @ GRAND FALLS | 0.003 | | 11.0 | 0.09 | 0.18 | 0.016 |
| LIMESTONE STR | 0.010 | | 11.0 | 1.70 | 1.50 | 0.026 |
| AROOSTOOK RIVER | 0.011 | | 13.0 | 0.21 | 0.32 | 0.019 |
| PRESQUILE RIVER | 0.003 | | 7.9 | 0.70 | 0.76 | 0.017 |
| MEDUXNEKEAG RIVER | 0.002 | | 12.0 | 0.14 | 0.24 | 0.016 |
| | | | | | | |
| STJ @ ST FRANCIS | 0.005 | 10.0 | 19.0 | 0.02 | 0.12 | 0.008 |
| ST FRANCIS RIVER | | 10.0 | 12.0 | 0.02 | 0.11 | 0.004 |
| LITTLE RIVER | 0.002 | 10.0 | 8.7 | 0.10 | 0.15 | 0.007 |
| STJ @ CLAIR | 0.003 | 10.0 | 19.0 | 0.03 | 0.11 | 0.007 |
| STJ @ CARON BK | | 10.0 | 18.0 | 0.05 | 0.13 | 0.007 |
| BAKER BROOK | 0.003 | 27.0 | 4.5 | 0.01 | 0.08 | 0.014 |
| STJ @ EDMUNDSTON | 0.007 | 10.0 | 16.0 | 0.06 | 0.13 | 0.010 |
| MADAWASKA RIVER | 0.017 | 48.0 | 19.0 | 0.04 | 0.10 | 0.022 |
| IROQUOIS RIVER | 0.008 | 24.0 | 13.0 | 0.15 | 0.18 | 0.015 |
| STJ @ ST BASILE | 0.009 | 10.0 | 15.0 | 0.10 | 0.18 | 0.023 |
| GREEN RIVER | 0.001 | 19.2 | 3.3 | 0.13 | 0.17 | 0.006 |
| GREEN RIVER | 0.007 | 10.0 | 3.5 | 0.12 | 0.18 | 0.022 |
| GREEN RIVER | 0.003 | 10.0 | 3.4 | 0.14 | 0.16 | 0.009 |
| QUISIBIS RIVER | 0.008 | 51.0 | 12.0 | 0.10 | 0.17 | 0.031 |
| SIEGAS RIVER | 0.010 | 125.0 | 18.0 | 0.04 | 0.13 | 0.019 |
| GRAND RIVER | 0.009 | 207.0 | 18.0 | 0.06 | 0.13 | |
| GRAND RIVER | 0.011 | 276.0 | 17.0 | 0.06 | 0.15 | 0.052 |
| GRAND RIVER | 0.009 | 364.0 | 18.0 | 0.06 | 0.15 | 0.070 |
| STJ @ ST LEONARD | 0.006 | 29.8 | 14.0 | 0.04 | 0.08 | 0.015 |
| STJ @ ST LEONARD | 0.009 | 15.0 | 14.0 | 0.06 | 0.13 | 0.012 |
| STJ @ ST LEONARD | 0.006 | 10.0 | 14.0 | 0.04 | 0.13 | 0.014 |
| STJ @ GRAND FALLS | 0.011 | 31.0 | 13.0 | 0.04 | 0.12 | 0.013 |
| LIMESTONE STR | 0.018 | 102.2 | 11.0 | 2.00 | 2.00 | 0.040 |

* OBSERVATIONS WHICH ARE BELOW THE DETECTION LIMIT ARE GIVEN THE DETECTION VALUE

APPENDIX 1a. WATER QUALITY DATA FOR THE TWENTY SAINT JOHN RIVER MONITORING STATIONS SAMPLED FROM MAY TO OCTOBER 1984

| SITE | TOTAL DISS. PHOSPHORUS MG/L | TOTAL SUSP. SOLIDS MG/L | HUMIC ACID MG/L | NITROGEN NO3 & NO2 MG/L | TOTAL NITROGEN MG/L | TOTAL PHOSPHORUS MG/L |
|---|---|---|---|---|---|---|
| ARDOSTOOK RIVER | 0.022 | 18.4 | 13.0 | 0.57 | 0.58 | 0.028 |
| PRESQUILE RIVER | 0.009 | 21.0 | 7.1 | 0.31 | 1.10 | 0.023 |
| MEDUXNEKEAG RIVER | 0.009 | 20.0 | 12.0 | 0.35 | 0.37 | 0.017 |
| STJ @ ST FRANCIS | 0.005 | 10.0 | 24.0 | 0.02 | 0.15 | 0.008 |
| ST FRANCIS RIVER | 0.005 | 10.0 | 18.0 | 0.09 | 0.16 | 0.010 |
| LITTLE RIVER | 0.008 | 10.0 | 20.0 | 0.08 | 0.19 | 0.014 |
| STJ @ CLAIR | 0.006 | 10.0 | 54.0 | 0.06 | 0.18 | 0.011 |
| STJ @ CARON BK | 0.007 | 10.0 | 30.0 | 0.10 | 0.21 | 0.014 |
| BAKER BROOK | 0.017 | 18.4 | 24.0 | 0.20 | 0.34 | 0.048 |
| STJ @ EDMUNDSTON | 0.008 | 10.0 | 22.0 | 0.09 | 0.18 | 0.008 |
| MADAWASKA RIVER | 0.006 | 10.0 | 9.7 | 0.05 | 0.10 | 0.014 |
| IROQUOIS RIVER | 0.004 | 10.0 | 6.6 | 0.09 | 0.14 | 0.009 |
| STJ @ ST BASILE | 0.008 | 10.0 | 19.0 | 0.01 | 0.10 | 0.023 |
| GREEN RIVER | 0.002 | 10.0 | 2.9 | 0.14 | 0.16 | 0.004 |
| QUISIBIS RIVER | 0.007 | 10.0 | 7.1 | 0.13 | 0.21 | 0.015 |
| SIEGAS RIVER | 0.006 | 20.5 | 12.0 | 0.10 | 0.16 | 0.026 |
| GRAND RIVER | 0.004 | 10.0 | 19.0 | 0.05 | 0.11 | 0.011 |
| STJ @ ST LEONARD | 0.005 | 10.0 | 17.0 | 0.07 | 0.13 | 0.011 |
| PRESQUILE RIVER | 0.015 | 10.0 | 7.5 | 0.95 | 1.00 | 0.022 |
| MEDUXNEKEAG RIVER | 0.005 | 10.0 | 9.0 | 0.26 | 0.33 | 0.007 |
| STJ @ ST FRANCIS | 0.001 | 10.0 | 12.0 | 0.12 | 0.23 | 0.010 |
| ST FRANCIS RIVER | 0.001 | 10.0 | 11.0 | 0.15 | 0.25 | 0.006 |
| LITTLE RIVER | 0.001 | 10.0 | 3.6 | 0.01 | 0.10 | 0.004 |
| STJ @ CLAIR | 0.004 | 10.0 | 14.0 | 0.07 | 0.17 | 0.014 |
| STJ @ CARON BK | 0.002 | 10.0 | 13.0 | 0.06 | 0.17 | 0.006 |
| MADAWASKA RIVER | 0.150 | 11.0 | 85.0 | 0.03 | 0.10 | 0.160 |
| IROQUOIS RIVER | 0.001 | 10.0 | 6.3 | 0.21 | 0.29 | 0.029 |
| STJ @ ST BASILE | 0.019 | 10.0 | 35.0 | 0.02 | 0.10 | 0.039 |
| GREEN RIVER | 0.001 | 10.0 | 1.8 | 0.11 | 0.14 | 0.004 |
| QUISIBIS RIVER | 0.001 | 10.0 | 3.3 | 0.15 | 0.19 | 0.004 |
| SIEGAS RIVER | 0.001 | 10.0 | 8.3 | 0.12 | 0.19 | 0.005 |
| GRAND RIVER | 0.001 | 10.0 | 6.0 | 0.07 | 0.10 | 0.006 |
| STJ @ ST LEONARD | 0.004 | 10.0 | 16.0 | 0.11 | 0.18 | 0.028 |
| STJ @ GRAND FALLS | 0.006 | 10.0 | 17.0 | 0.06 | 0.15 | 0.016 |
| LIMESTONE STR | 0.003 | 10.0 | 5.1 | 1.80 | 1.90 | 0.011 |
| ARDOSTOOK RIVER | 0.026 | 10.0 | 10.0 | 0.21 | 0.30 | 0.038 |

* OBSERVATIONS WHICH ARE BELOW THE DETECTION LIMIT ARE GIVEN THE DETECTION VALUE

APPENDIX 1b. WATER QUALITY DATA FOR ELEVEN SAINT JOHN RIVER
STATIONS SAMPLED DURING DEC 1983 AND FEB 1984

| SITE | STATION NUMBER | SAMPLE NUMBER | SAMPLE DATE | SAMPLE TIME | WATER TEMPERATURE DEG. C | DISS. OXYGEN MG/L | FIELD PH | FIELD SP. COND. US/CM | LAB PH | LAB SP. COND. US/CM | WATER COLOUR H. U. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| STJ @ ST LEONARD | 00NB01AF0002 | 303191 | 14-DEC-83 | 1645 | 0.5 | 14.1 | | | 6.2 | 84 | 20 |
| LIMESTONE STR | 00NB01AG0003 | 303189 | 14-DEC-83 | 1445 | 1.0 | 13.9 | | | 6.6 | 225 | 30 |
| PRESQUILE RIVER | 00NB01AJ0012 | 303187 | 14-DEC-83 | 1115 | 0.7 | 14.7 | | | 6.5 | 200 | 30 |
| MEDUXNEKEAG RIVER | 00NB01AJ0029 | 303186 | 14-DEC-83 | 915 | | 14.9 | | | 6.3 | 114 | 20 |
| STJ @ GRAND FALLS | 01NB01AF0005 | 303190 | 14-DEC-83 | 1545 | 0.5 | | | | 6.3 | 84 | 25 |
| AROOSTOOK RIVER | 01NB01AG0001 | 303188 | 14-DEC-83 | 1345 | 0.5 | 14.2 | | | 6.3 | 97 | 40 |
| MADAWASKA RIVER | 00NB01AD0016 | 303193 | 15-DEC-83 | 1210 | 2.3 | 12.7 | | | 6.4 | 125 | 10 |
| STJ @ CARON BK | 00NB01AD0017 | 303192 | 15-DEC-83 | 1115 | 0.5 | 14.1 | | | 6.2 | 59 | 25 |
| GREEN RIVER | 00NB01AF0021 | 303194 | 15-DEC-83 | 1420 | 0.6 | 14.5 | | | 6.3 | 87 | 5 |
| GRAND RIVER | 00NB01AF0023 | 303195 | 15-DEC-83 | 1515 | 0.5 | | | | 6.3 | 101 | 15 |
| MEDUXNEKEAG RIVER | 00NB01AJ0029 | 303836 | 30-JAN-84 | 1500 | 0.6 | | | | 7.8 | 197 | 10 |
| LIMESTONE STR | 00NB01AG0003 | 303839 | 31-JAN-84 | 1410 | 0.0 | 14.0 | | | 8.0 | 294 | 5 |
| PRESQUILE RIVER | 00NB01AJ0012 | 303837 | 31-JAN-84 | 930 | 0.2 | 13.4 | | | 7.9 | 36 | 5 |
| STJ @ GRAND FALLS | 01NB01AF0005 | 303840 | 31-JAN-84 | 1545 | 0.3 | 13.8 | | | | | 20 |
| AROOSTOOK RIVER | 01NB01AG0001 | 303838 | 31-JAN-84 | 1130 | 0.6 | 14.0 | | | 7.2 | 114 | 10 |
| MADAWASKA RIVER | 00NB01AD0016 | 303844 | 01-FEB-84 | 1515 | 0.5 | | | | | | 10 |
| STJ @ ST LEONARD | 00NB01AF0002 | 303841 | 01-FEB-84 | 915 | 0.0 | | | | 7.2 | 110 | 25 |
| GREEN RIVER | 00NB01AF0021 | 303843 | 01-FEB-84 | 1335 | 0.2 | | | | 7.4 | 96 | 5 |
| GRAND RIVER | 00NB01AF0023 | 303842 | 01-FEB-84 | 1100 | | | | | 7.6 | 161 | 5 |
| ST FRANCIS RIVER | 00NB01AD0013 | 303846 | 02-FEB-84 | 1115 | 0.5 | | | | 7.4 | 89 | 20 |
| STJ @ CARON BK | 00NB01AD0017 | 303845 | 02-FEB-84 | 930 | 0.0 | | | | 7.0 | 71 | 20 |

| SITE | TURBIDITY JTU | TOTAL ALKALINITY MG/L | CALCIUM MG/L | MAGNESIUM MG/L | POTASSIUM MG/L | SODIUM MG/L | SULPHATE MG/L | CHLORIDE MG/L | EXT. CADMIUM MG/L * | EXT. LEAD MG/L * | EXT. COPPER MG/L * |
|---|---|---|---|---|---|---|---|---|---|---|---|
| STJ @ ST LEONARD | 1.1 | 27.0 | 12.0 | 1.8 | 0.2 | 2.2 | 7.1 | 2.8 | 0.001 | | 0.002 |
| LIMESTONE STR | 5.1 | 73.2 | 38.0 | 3.7 | 0.7 | 2.5 | 17.4 | 8.0 | 0.001 | | 0.002 |
| PRESQUILE RIVER | 7.1 | 69.2 | 33.0 | 2.6 | 0.5 | 2.7 | 12.1 | 6.4 | 0.001 | | 0.002 |
| MEDUXNEKEAG RIVER | 9.2 | 38.5 | 18.0 | 1.7 | 0.5 | 2.2 | 7.7 | 4.3 | 0.001 | | 0.002 |
| STJ @ GRAND FALLS | 1.2 | 27.9 | 12.0 | 1.7 | 0.2 | 2.1 | 7.2 | 2.6 | 0.001 | | 0.002 |
| AROOSTOOK RIVER | 1.9 | 28.6 | 14.0 | 1.9 | 0.2 | 1.7 | 9.0 | 3.3 | 0.001 | | 0.002 |
| MADAWASKA RIVER | 1.6 | 48.2 | 19.0 | 2.3 | 0.3 | 3.1 | 5.6 | 3.7 | 0.001 | | 0.002 |
| STJ @ CARON BK | 1.0 | 17.7 | 8.6 | 1.2 | 0.1 | 1.4 | 6.2 | 1.3 | 0.001 | | 0.002 |
| GREEN RIVER | 1.0 | 35.3 | 13.0 | 2.0 | 0.2 | 1.5 | 4.4 | 0.7 | 0.001 | | 0.002 |
| GRAND RIVER | 2.5 | 39.8 | 17.0 | 1.3 | 0.4 | 1.6 | 5.0 | 1.9 | 0.001 | | 0.002 |
| MEDUXNEKEAG RIVER | 0.5 | 73.9 | 33.0 | 2.9 | 0.6 | 3.8 | 11.7 | 5.8 | 0.001 | | 0.002 |
| LIMESTONE STR | 0.6 | 117.0 | 59.0 | 5.8 | 0.7 | 3.2 | 22.5 | 10.2 | 0.001 | | 0.002 |
| PRESQUILE RIVER | 0.5 | 136.0 | 62.0 | 5.0 | 1.1 | 3.9 | 21.2 | 9.6 | 0.001 | | 0.002 |
| STJ @ GRAND FALLS | 0.7 | 38.1 | 17.0 | | 0.5 | 2.9 | 8.7 | | | | |
| AROOSTOOK RIVER | 0.5 | 38.7 | 17.0 | 2.4 | 0.5 | 2.2 | 9.1 | 3.3 | 0.001 | | 0.002 |
| MADAWASKA RIVER | 0.5 | 52.2 | 20.0 | 2.5 | 0.5 | 2.5 | 6.1 | | | | |
| STJ @ ST LEONARD | 0.7 | 36.2 | 15.0 | 1.7 | 0.5 | 3.1 | 5.5 | 3.7 | 0.001 | | 0.002 |
| GREEN RIVER | 0.5 | 41.1 | 15.0 | 2.2 | 0.2 | 1.7 | 4.9 | 1.0 | 0.001 | | 0.002 |
| GRAND RIVER | 0.6 | 71.1 | 29.0 | 2.0 | 0.3 | 2.0 | 6.0 | 2.0 | 0.001 | | 0.002 |
| ST FRANCIS RIVER | 0.6 | 31.7 | 14.0 | 1.1 | 0.3 | 1.9 | 6.1 | 2.0 | 0.001 | | 0.002 |
| STJ @ CARON BK | 0.5 | 22.8 | 1.0 | 1.4 | 0.3 | 1.5 | 6.5 | 1.3 | 0.001 | | 0.002 |

* OBSERVATIONS WHICH ARE BELOW THE DETECTION
LIMIT ARE GIVEN THE DETECTION VALUE

APPENDIX 1b. WATER QUALITY DATA FOR ELEVEN SAINT JOHN RIVER
STATIONS SAMPLED DURING DEC 1983 AND FEB 1984

| SITE | EXT. IRON MG/L | DISS. ORG. CARBON MG/L | DISS. ALUMINIUM MG/L | TOTAL DISS. PHOSPHORUS MG/L | TOTAL SUSP. SOLIDS MG/L | HUMIC ACID MG/L | NITROGEN NO3 & NO2 MG/L | TOTAL NITROGEN MG/L | TOTAL PHOSPHORUS MG/L |
|---|---|---|---|---|---|---|---|---|---|
| STJ @ ST LEONARD | 0.09 | 6.0 | 0.045 | 0.004 | | 12.0 | 0.18 | 0.32 | 0.008 |
| LIMESTONE STR | 0.25 | 3.7 | 0.030 | 0.029 | | 8.8 | 2.80 | 3.00 | 0.100 |
| PRESQUILE RIVER | 0.29 | 2.9 | 0.002 | 0.016 | | 7.9 | 0.45 | 1.30 | 0.045 |
| MEDUXNEKEAG RIVER | 0.38 | 3.4 | 0.100 | 0.021 | | 8.8 | 0.45 | 0.56 | 0.075 |
| STJ @ GRAND FALLS | 0.09 | 5.9 | 0.045 | 0.004 | | 12.0 | 0.22 | 0.32 | 0.010 |
| AROOSTOOK RIVER | 0.18 | 7.2 | 0.075 | 0.014 | | 14.0 | 0.72 | 0.92 | 0.021 |
| MADAWASKA RIVER | 0.10 | 3.4 | 0.010 | 0.007 | | 7.1 | 0.18 | 0.29 | 0.020 |
| STJ @ CARON BK | 0.10 | 6.4 | 0.070 | 0.003 | | 13.0 | 0.18 | 0.29 | 0.008 |
| GREEN RIVER | 0.06 | 1.4 | 0.010 | 0.001 | | 2.7 | 0.30 | 0.35 | 0.004 |
| GRAND RIVER | 0.21 | 4.0 | 0.037 | 0.002 | | 8.4 | 0.20 | 0.26 | 0.015 |
| MEDUXNEKEAG RIVER | | 2.4 | 0.015 | 0.007 | 10 | 4.0 | 0.95 | 0.80 | 0.009 |
| LIMESTONE STR | 0.06 | 1.2 | 0.010 | 0.025 | 10 | 11.0 | 3.60 | 4.20 | 0.028 |
| PRESQUILE RIVER | 0.05 | 3.3 | 0.010 | 0.015 | 10 | 8.7 | 2.60 | 3.20 | 0.022 |
| STJ @ GRAND FALLS | 0.08 | | | 0.006 | | | 0.23 | 0.29 | |
| AROOSTOOK RIVER | 0.06 | 6.4 | 0.032 | 0.032 | 10 | 3.8 | 0.85 | 0.76 | 0.036 |
| MADAWASKA RIVER | 0.05 | | | 0.008 | | | 0.15 | 0.22 | |
| STJ @ ST LEONARD | 0.06 | 6.6 | 0.022 | 0.005 | 10 | 4.0 | 0.20 | 0.31 | 0.009 |
| GREEN RIVER | | 1.0 | 0.010 | 0.001 | 10 | 1.3 | 0.31 | 0.35 | 0.013 |
| GRAND RIVER | 0.07 | 1.5 | 0.010 | 0.001 | 10 | 1.3 | 0.25 | 0.29 | 0.008 |
| ST FRANCIS RIVER | 0.06 | 4.7 | 0.015 | 0.004 | 10 | 9.6 | 0.22 | 0.27 | 0.006 |
| STJ @ CARON BK | 0.07 | 6.0 | 0.037 | 0.003 | 10 | 9.9 | 0.25 | 0.32 | 0.006 |

* OBSERVATIONS WHICH ARE BELOW THE DETECTION
LIMIT ARE GIVEN THE DETECTION VALUE